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LONG-FINNED PILOT WHALE (*Globicephala melas*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of pilot whales in the Western Atlantic — the Atlantic or long-finned pilot whale, *Globicephala melas*, and the short-finned pilot whale, *G. macrorhynchus*. These species are difficult to identify to the species level at sea; therefore, some of the descriptive material below refers to *Globicephala* sp., and is identified as such. The species boundary is considered to be in the New Jersey to Cape Hatteras area. Sightings north of this area are likely *G. melas*.

Pilot whales (*Globicephala* sp.) are distributed principally along the continental shelf edge in the winter and early spring off the northeast USA coast, (CETAP 1982; Payne and Heinemann 1993; Abend and Smith 1999). In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters, and remain in these areas through late autumn (CETAP 1982; Payne and Heinemann 1993). In general, pilot whales occupy areas of high relief or submerged banks. They are also associated with the Gulf Stream north wall and thermal fronts along the continental shelf edge (Waring *et al.* 1992; NMFS unpublished data).

The long-finned pilot whale is distributed from North Carolina to North Africa (and the Mediterranean) and north to Iceland, Greenland and the Barents Sea (Sergeant 1962; Leatherwood *et al.* 1976; Abend 1993; Buckland *et al.* 1993; Abend and Smith 1999). The stock structure of the North Atlantic population is uncertain (Anon. 1993a; Fullard *et al.* 2000). Recent morphometrics (Bloch and Lastein 1993) and genetics (Siemann 1994; Fullard *et al.* 2000) studies have provided little support for stock structure across the Atlantic (Fullard *et al.* 2000). However, Fullard *et al.* (2000) have proposed a stock structure that is correlated to sea surface temperature: 1) a cold-water population west of the Labrador/North Atlantic current and 2) a warm-water population that extends across the Atlantic in the Gulf Stream.

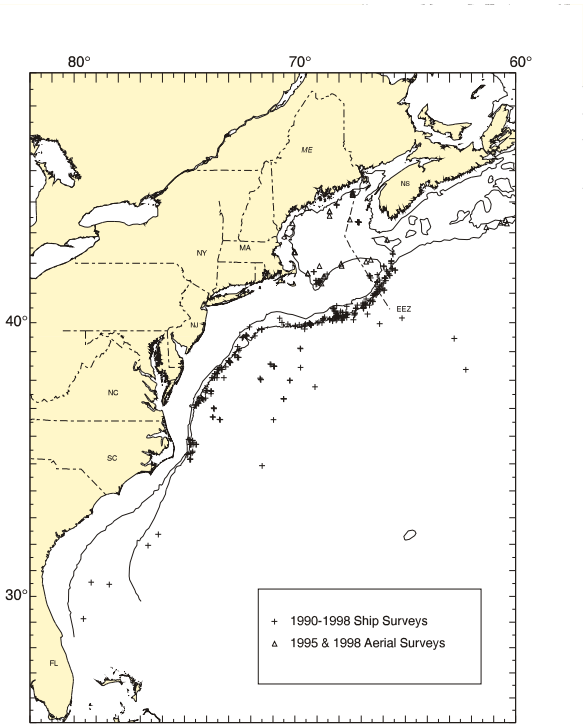

Figure 1. *Distribution of pilot whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1990-1998. Isobaths are at 100 m and 1,000 m.*

POPULATION SIZE

The total number of long-finned pilot whales off the eastern USA and Canadian Atlantic coast is unknown, although ten estimates from selected regions of the habitat do exist for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas (Figure 1). Two estimates were derived from catch data and population models that estimated the abundance of the entire stock. Seven seasonal estimates are available from selected regions in USA waters during spring, summer and autumn 1978-82, August 1990, June-July 1991, August-September 1991, June-July 1993, July-September 1995, and July-August 1998. Because long-finned and short-finned pilot whales are difficult to identify at sea, seasonal abundance estimates were reported for *Globicephala* sp., both long-finned and short-finned pilot whales. One estimate is available from the Gulf of St. Lawrence.

Mitchell (1974) used cumulative catch data from the 1951-1961 drive fishery off Newfoundland to estimate the initial population size (ca. 50,000 animals).

Mercer (1975), used population models to estimate a population in the same region of between 43,000 and 96,000 long-finned pilot whales, with a range of 50,000-60,000 being considered the best estimate.

An abundance of 11,120 (CV=0.29) *Globicephala* sp. was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982). An abundance of 3,636 (CV=0.36) *Globicephala* sp. was estimated from a June and July 1991 shipboard line transect sighting survey conducted primarily between the 200 and 2,000 m isobaths from Cape Hatteras to Georges Bank (Waring *et al.* 1992; Waring 1998). ~~An a~~Abundances of 3,368 (CV=0.28) and 5,377 (CV=0.53) *Globicephala* sp. ~~was~~were estimated from line transect aerial surveys conducted from August to September 1991 using the Twin Otter and AT-11 aircrafts, respectively (Anon. 1991). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations. Further, due to changes in survey methodology, these data should not be used to make comparisons to more current estimates.

An abundance of 668 (CV=0.55) *Globicephala* sp. was estimated from a June and July 1993 shipboard line transect sighting survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Anon. 1993b). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993). Estimates include school-size bias, if applicable, but do not include corrections for *g(0),* the probability of detecting a group on the track line, or for dive-time. Variability was estimated using bootstrap resampling techniques.

An abundance of 8,176 (CV=0.65) *Globicephala* sp. was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka *et al.* in review). Total track line length was 32,600 km. The ships covered waters between the 50 and 1000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom ~~depth contour line~~ isobath. Data collection and analysis methods used were described in Palka (1996).

Kingsley and Reeves (1998) obtained an abundance estimate of 1,600 long-finned pilot whales (CV=0.65) from a late August and early September aerial survey of cetaceans in the Gulf of St. Lawrence in 1995 and 1998 (Table 1). Based on an examination of long-finned pilot whale summer distribution patterns and information on stock structure, it was deemed appropriate to combine these estimates with NMFS 1995 summer survey data. The best 1995 abundance estimate for *Globicephala* sp. is 9,776 (CV=0.55), the sum of the estimates from the USA and Canadian surveys, where the estimate from the USA survey is 8,176 (CV=0.65) and from the Canadian 1,600 (CV=0.65).

An abundance of 9,800 (CV=0.34) *Globicephala* sp. was estimated from a line transect sighting survey conducted during July 6 to September 6, 1998 by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38° N) (Figure 1; Palka *et al.* in review). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 4,724 (CV=0.61) *Globicephala* sp. was estimated from a shipboard line transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 5,570 km of track line in waters south of Maryland (38°N) (Figure 1; Mullin in press). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993) where school size bias and ship attraction were accounted for.

The best available abundance estimate for *Globicephala* sp. is 14,524 (CV=0.30), the sum of the estimates from the two 1998 USA Atlantic surveys, where the estimate from the northern USA Atlantic is 9,800 (CV=0.34) and from the southern USA Atlantic is 4,724 (CV=0.61). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat.

Table 1. Summary of abundance estimates for the western North Atlantic *Globicephala* sp. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Sep 1995	Virginia to Gulf of St. Lawrence	8,176	0.65
Aug-Sep 1995	Gulf of St. Lawrence	1,600	0.65
Jul-Sep 1995	Virginia to Gulf of St. Lawrence	9,776	0.55
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	9,800	0.34
Jul-Aug 1998	Florida to Maryland	4,724	0.61
Jul-Sep 1998	Gulf of St. Lawrence to Florida (COMBINED)	14,524	0.30

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for *Globicephala* sp. is 14,524 (CV=0.30). The minimum population estimate for *Globicephala* sp. is 11,343 (CV=0.30).

Current Population Trend

There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity include those from animals taken in the Newfoundland drive fishery: calving interval 3.3 years; lactation period about 21-22 months; gestation period 12 months; births mainly from June to November; length at birth is 177 cm; mean length at sexual maturity is 490 cm for males and 356 cm for females; age at sexual maturity is 12 years for males and 6 years for females; mean adult length is 557 cm for males and 448 cm for females; and maximum age was 40 for males and 50 for females (Sergeant 1962; Kasuya *et al*. 1988). Analysis of data recently collected from animals taken in the Faroe Islands drive fishery produced higher values for all parameters (Bloch *et al*. 1993; Desportes *et al*. 1993; Martin and Rothery 1993). These differences are likely related, at least in part, to larger sample sizes and newer analytical techniques.

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for *Globicephala* sp. is 11,343 (CV=0.30). The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.48 because the CV of the average mortality estimate is between 0.3 and 0.6 (Wade and Angliss 1997) and because this stock is of unknown status. PBR for the western North Atlantic *Globicephala* sp. is 108.

ANNUAL HUMAN-CAUSED MORTALITY

Total fishery-related mortality and serious injury cannot be estimated separately for the two species of pilot whales in the US Atlantic EEZ because of the uncertainty in species identification by fishery observers. The

Atlantic Scientific Review Group advised adopting the risk-averse strategy of assuming that either species might have been subject to the observed fishery-related mortality and serious injury. Total annual estimated average fishery-related mortality or serious injury to this stock during ~~1996-2000~~1997-2001 in the USA fisheries listed below was ~~193~~221 pilot whales (~~CV=0.43~~CV=0.36) (Table 2). ~~Canadian mortality estimate for 1996 from the Nova Scotia trawl fisheries is 6 long-finned pilot whales. It is not possible to estimate variance of the Canadian estimate. The total average annual mortality estimate for 1996-2000 from the USA and Nova Scotia trawl fisheries is 199 (CV=0.43) (Table 2).~~

Fishery Information

USA

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the USA. A fishery observer program, which has collected fishery data and information on incidental bycatch of marine mammals, was established in 1977 with the implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA). DWF effort in the US Atlantic EEZ under MFCMA has been directed primarily towards Atlantic mackerel and squid. An average of 120 different foreign vessels per year (range 102-161) operated within the US Atlantic EEZ during 1977 through 1982. In 1982, there were 112 different foreign vessels; 18 (16%) were Japanese tuna longline vessels operating along the USA Atlantic coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. The number of foreign vessels operating within the US Atlantic EEZ each year between 1983 and 1991 averaged 33 and ranged from 9 to 67. The number of Japanese longline vessels included among the DWF vessels averaged 6 and ranged from 3 to 8 between 1983 and 1988. MFCMA observer coverage on DWF vessels was 25-35% during 1977-1982, increased to 58%, 86%, 95%, and 98%, respectively, during 1983-1986, and 100% observer coverage was maintained from 1987 to 1991. Foreign fishing operations for squid ceased at the end of the 1986 fishing season and, for mackerel, at the end of the 1991 fishing season.

During 1977-1991, observers in this program recorded 436 pilot whale mortalities in foreign-fishing activities (Waring *et al*. 1990; Waring 1995). A total of 391 (90%) were taken in the mackerel fishery, and 41 (9%) occurred during *Loligo* and *Illex* squid-fishing operations. This total includes 48 documented takes by USA vessels involved in joint-venture fishing operations in which USA captains transfer their catches to foreign processing vessels. Due to temporal fishing restrictions, the bycatch occurred during winter/spring (December to May) in continental shelf and continental shelf edge waters (Fairfield *et al*. 1993; Waring 1995); however, the majority of the takes occurred in late spring along the 100 m isobath. Two animals were also caught in both the hake ~~fishery~~ and tuna longline fisheries (Waring *et al*. 1990).

~~The distribution of long-finned pilot whales, a northern species, overlaps with that of the short-finned pilot whales, a predominantly southern species, between 35°30'N to 38°00'N (Leatherwood *et al*. 1976). Although long-finned pilot whales are most likely taken in the waters north of Delaware Bay, many of the pilot whale takes are not identified to species and bycatch does occur in the overlap area. In this summary, therefore, long-finned pilot whales (*Globicephala melas*) and unidentified pilot whales (*Globicephala* sp.) are considered together.~~

Data on current incidental takes in USA fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year several fisheries have been covered by the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) and provides observer coverage of vessels fishing south of Cape Hatteras.

Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet, pelagic longline, pelagic pair trawl, bluefin tuna purse seine, North Atlantic bottom trawl, Atlantic squid, mackerel, butterfish trawl, and mid-Atlantic coastal gillnet fisheries, but no mortalities or serious injuries have been documented in the Northeast multispecies sink gillnet ~~fisheries~~ fishery.

Pelagic Drift Gillnet

The estimated total number of hauls in the pelagic drift gillnet fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. The estimated number of hauls in 1991, 1992, 1993, 1994, 1995, 1996 and 1998 were 233, 243, 232, 197, 164, 149 and 113, respectively. In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997.

Further, in January 1999 NMFS issued a Final Rule to prohibit the use of driftnets (*i.e.*, permanent closure) in the North Atlantic swordfish fishery (50 CFR Part 630). Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. From 1994 to 1998, between 10 and 13 vessels participated in the fishery. Observer coverage, expressed as percent of sets observed, was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994, 99% in 1995, 64% in 1996, no fishery in 1997, and 99% in 1998. Effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras. Examination of the species composition of the catch and locations of the fishery throughout the year, suggested that the pelagic drift gillnet fishery be stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of the total bycatch from 1989 to 1993 were obtained using the aggregated (pooled 1989-1993) catch rates, by ~~strata~~ stratum (Northridge 1996). Estimates of total annual bycatch for 1994 and 1995 were estimated from the sum of the observed caught and the product of the average bycatch per haul and the number of unobserved hauls as recorded in self-reported fisheries information. Variances were estimated using bootstrap re-sampling techniques. Between 1989 and 1998, 87 mortalities were observed in the large pelagic drift gillnet fishery. The annual fishery-related mortality (CV in parentheses) was 77 in 1989 (0.24), 132 in 1990 (0.24), 30 in 1991 (0.26), 33 in 1992 (0.16), 31 in 1993 (0.19), 20 in 1994 (0.06), 9.1 in 1995 (0), 11 in 1996 (.17), no fishery in 1997, and 12 in 1998 (0). Since this fishery no longer exists it has been excluded from Table 2. Pilot whales were taken along the continental shelf edge, northeast of Cape Hatteras in January and February. Takes were recorded at the continental shelf edge east of Cape Charles, Virginia, in June. Pilot whales were taken from Hydrographer Canyon along the Great South Channel to Georges Bank from July to November. Takes occurred at the Oceanographer Canyon continental shelf break and along the continental shelf northeast of Cape Hatteras in October-November.

Pelagic Pair Trawl

~~Effort in the~~ The pelagic pair trawl fishery ~~increased during the period 1989 to 1993, from zero hauls in 1989 and 1990, to~~ operated as an experimental fishery from 1991 to 1995, with an estimated 171 hauls in 1991, ~~and then to an estimated~~ 536 ~~hauls~~ in 1992, 586 in 1993, 407 in 1994, and 440 in 1995. This fishery ceased operations in 1996 when NMFS rejected a petition to consider pair trawl gear as an authorized gear type in the Atlantic tunas fishery. The fishery operated ~~from~~ in August ~~-~~to November in 1991, ~~from~~ June ~~-~~to November in 1992, ~~from~~ June ~~-~~to October in 1993, and ~~from~~ mid-summer to November in 1994 and 1995. Sea sampling began in October 1992 (Gerrior *et al*. 1994), and 48 sets (9% of the total) were sampled in that season; 102 hauls (17% of the total) were sampled in 1993. In 1994 and 1995, 212 (52%) and 238 (54%), respectively, of the sets were observed. Twelve vessels have operated in this fishery. The fishery extended from 35°N to 41°N, and from 69°W to 72°W. Approximately 50% of the total effort was within a one degree square at 39°N, 72°W, around Hudson Canyon. Examination of the 1991-1993 locations and species composition of the bycatch showed little seasonal change for the six months of operation and did not warrant any seasonal or areal stratification of this fishery (Northridge 1996). Five pilot whale (*Globicephala* sp.) mortalities were reported in the self-reported fisheries information in 1993. In 1994 and 1995 observers reported 1 and 12 mortalities, respectively. The estimated fishery-related mortality to pilot whales in the USA Atlantic attributable to this fishery in 1994 was 2.0 (CV=0.49) and 22 (CV=0.33) in 1995. Since this fishery no longer exists, it has been excluded from Table 2.

During the 1994 and 1995 experimental fishing seasons, fishing gear experiments were conducted to collect data on environmental parameters, gear behavior, and gear handling practices to evaluate factors affecting catch and bycatch (Goudey 1995, 1996), but the results were inconclusive. ~~Results of these studies were inconclusive in identifying factors responsible for marine mammal bycatch.~~

Pelagic Longline

Total effort, excluding the Gulf of Mexico, for the pelagic longline fishery, based on mandatory self-reported fisheries information, was 11,279 sets in 1991, 10,311 sets in 1992, 10,444 sets in 1993, 11,082 sets in 1994, 11,493 sets in 1995, 9,864 sets in 1996, 9,499 sets in 1997, 7,589 sets in 1998, 6,786 sets in 1999, and 6,582 sets in 2000 (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999a; Yeung *et al*. 2000). ~~This~~ In the 2001 SAR, the annual effort has been recalculated to include those sets targeting other species in conjunction with tuna/swordfish, instead of just effort that exclusively targeted tuna/swordfish as in previous reports (Johnson *et al.* 1999; Yeung 1999a). The result was an average increase in self-reported effort of roughly 10% ~~on the average~~ (Yeung *et al.* 2000). The fishery has been observed from January to March off Cape Hatteras, in May and June in the entire mid-Atlantic, and in July through December in the mid-Atlantic Bight and off Nova Scotia. This fishery has been monitored with 3-6% observer coverage, in terms of sets observed, since 1992. The 1993-1997

estimated take was based on a revised analysis of the observed incidental take and self-reported incidental take and effort data, and replace previous estimates for the 1990-1993 and 1994-1995 periods (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999). Further, Yeung (1999b) revised the 1992-1997 fishery mortality estimates in Johnson *et al.* (1999) to include seriously injured animals. The 1998 and 1999 bycatch estimates were from Yeung (1999a) and Yeung *et al.* (2000), respectively. Most of the estimated marine mammal bycatch was from US Atlantic EEZ waters between South Carolina and Cape Cod (Johnson *et al.* 1999). Pilot whales are frequently observed to feed on hooked fish, particularly big-eye tuna (NMFS unpublished data). Between 1992 and 2000, 62 pilot whales (including 2 identified as a short-finned pilot whales) were released alive, including 32 that were considered seriously injured (of which 1 was identified as a short-finned pilot whale), and 2 mortalities were observed. January-March bycatch was concentrated on the continental shelf edge northeast of Cape Hatteras. Bycatch was recorded in this area during April-June, and takes also occurred north of Hydrographer Canyon off the continental shelf in water over 1,000 fathoms during April-June. During the July-September period, takes occurred on the continental shelf edge east of Cape Charles, Virginia, and on Block Canyon slope in over 1,000 fathoms of water. October-December bycatch occurred ~~along~~ between the 20 ~~to~~ and 50 fathom contour lines between Barnegat Bay and Cape Hatteras. The estimated fishery-related mortality to pilot whales in the USA Atlantic (excluding the Gulf of Mexico) attributable to this fishery was: 127 in 1992 (CV=1.00), 93 in 1999 (CV=1.00), and 24 in 2000 (CV=1.0). The estimated serious injuries were 40 (CV=0.71) in 1992, 19 (CV=1.00) in 1993, 232 (CV=0.53) in 1994, 345 (CV= 0.51) in 1995, 0 from 1996 to 1998, 288 (CV=0.74) in 1999, and 109 (CV=1.0) in 2000 (includes 37 estimated short-finned pilot whales in 1995 (CV=1.00)); average annual mortality ~~between~~ in 1996-2000 was 103 pilot whales (CV=0.63) (Table 2). ~~Seriously injured and released alive animals~~ Animals released alive but judged to have been seriously injured are combined with mortalities in the category 'combined mortality'.

Bluefin Tuna Purse Seine

The tuna purse seine fishery between Cape Hatteras and Cape Cod is directed at small and medium bluefin and skipjack for the canning industry, while north of Cape Cod, purse seine vessels are directed at large medium and giant bluefin tuna (NMFS 1995). The latter fishery is entirely separate from any other Atlantic tuna purse seine fishery. Spotter aircraft are used to locate fish schools. The official start date is August 15, set by regulation. Individual vessel quotas (IVQs) and a limited access system prevent a derby fishery situation. Catch rates are high with this gear and consequently the season usually only lasts a few weeks for large mediums and giants. The 1996 regulations allocated 250 MT (5 IVQs) with a minimum of 90% giants and no more than 10% large mediums. Limited observer data are available for the bluefin tuna purse seine fishery. Out of 45 total trips made in 1996, 43 trips (95.6%) were observed. Forty-four sets were made on the 43 observed trips and all sets were observed. A total of 136 days were covered. Two interactions with pilot whales were observed in 1996. In one interaction, the net was actually pursed around one pilot whale, the rings were released and the animal escaped alive, condition unknown. This set occurred east of the Great South Channel and just north of the Cultivator Shoals region on Georges Bank. In a second interaction, 5 pilot whales were encircled in a set. The net was opened prior to pursing to let the whales swim free, apparently uninjured. This set occurred on the Cultivator Shoals region on Georges Bank. Since 1996, this fishery has not been observed.

~~**North Atlantic Bottom Trawl**~~

~~Vessels in the North Atlantic bottom trawl fishery, a Category III fishery under the MMPA, were observed in order to meet fishery management needs, rather than marine mammal management needs. An average of 970 (CV=0.04) vessels (full and part time) participated annually in the fishery during 1989-1993. The fishery is active in New England in all seasons. One mortality was documented in 1990, and 1 animal was released alive and uninjured in 1993. The estimated fishery-related mortality to pilot whales in the USA Atlantic attributable to this fishery was: 0 in 1994-1998, 228 in 1999, and 0 in 20002000-2001. The average annual mortality between 1996-20001997 and 2001 was 46 pilot whales (CV=1.03) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.~~

~~**Atlantic Squid, Mackerel, Butterfish Trawl**~~

~~The mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The fishery occurs along the USA mid-Atlantic continental shelf region between New Brunswick, Canada, and Cape Hatteras year around. The mackerel trawl fishery was classified as a Category II fishery in 1990 and the squid fishery was originally classified as a Category II fishery in~~

~~1990, but was reclassified as a Category III fishery in 1992. The combined fishery was then reclassified as a Category II fishery in 1995. In 1996, mackerel, squid, and butterfish trawl fisheries were combined into the Atlantic squid, mackerel, butterfish trawl fishery, and maintained a Category II classification. Three fishery-related mortalities of pilot whales were reported in self-reported fisheries information from the mackerel trawl fishery between 1990 and 1992. Six mortalities were observed in 1996, 1 in years 1998, 1 in 1999, and 2 in 2000, and 0 in 2001. The 1996, 1998 and 2000 bycatches occurred in the *Illex* squid fishery, and the 1999 in the *Loligo* fishery. The estimated fishery-related mortality of pilot whales in the USA Atlantic attributable to this fishery was: 45 in 1996 (CV=1.27), 0 in 1997, 85 in 1998 (CV=0.65), 49 in 1999 (CV=0.97), and 34 in 2000 (CV=0.65), and 0 in 2001, average annual mortality between 1996 and 20001997 and 2001 was 4334 pilot whales (CV=0.45) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.~~

Southern New England/Mid-Atlantic Squid, Mackerel, Butterfish Trawl Fisheries

In 1996, mackerel, squid, and butterfish trawl fisheries were combined into one Atlantic squid, mackerel, and butterfish fishery management plan and designated as a Category II fishery. Because of spatial and temporal differences in the harvesting of *Illex* and *Loligo* squid, and Atlantic mackerel, each one of these sub-fisheries are described separately. Butterfish (*Peprilus triacanthus*) undergo a northerly inshore migration during the summer months and southerly offshore migration during the winter months and are mainly caught as incidental bycatch to the directed squid and mackerel fisheries. Fishery observers suggest that a significant amount of butterfish discarding occurs at sea. The *Illex* and *Loligo* squid fisheries are managed by moratorium permits, gear and area restrictions, quotas, and trip limits. The Atlantic mackerel and butterfish fisheries are managed by an annual quota system.

Historically, the mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The mackerel trawl fishery was classified as a Category II fishery since 1990 and the squid fishery was originally classified as a Category II fishery in 1990, but was reclassified as a Category III fishery in 1992. The combined fishery was then reclassified as a Category II fishery in 1995.

***Illex* Squid**

The USA domestic fishery, ranging from Southern New England to Cape Hatteras North Carolina, reflects patterns in the seasonal distribution of *Illex* squid (*Illex illecebrosus*). *Illex* are harvested offshore mainly by small mesh otter trawlers when they are distributed in continental shelf and slope waters during the summer months (June-September)(Clark ed. 1998). Since 1996, 45% of all pilot whale takes observed were caught incidental to *Illex* squid fishing operations; 1 in 1996, 1 in 1998, and 2 in 2000. Annual observer coverage of this fishery has varied widely and reflects only the months when the fishery is active. Between 1996 and 2001, annual observer coverage was 3.7%, 6.21%, 0.97%, 2.84%, 11.11%, and 0.00%, respectively. The estimated fishery-related mortality of pilot whales attributable to this fishery was: 45 in 1996 (CV=1.27), 0 in 1997, 85 in 1998 (CV=0.65), 0 in 1999, 34 in 2000 (CV=0.65), and 0 in 2001. The average annual mortality between 1997 and 2001 was 30 pilot whales (CV=0.50) (Table 2).

***Loligo* Squid**

The USA domestic fishery for *Loligo* squid (*Loligo pealeii*) occurs mainly in Southern New England and mid-Atlantic waters. Fishery patterns reflect *Loligo* seasonal distribution where most effort is directed offshore near the edge of the continental shelf during the fall and winter months (October-March), and inshore during the spring and summer months (April-September) (Clark ed. 1998). This fishery is dominated by small-mesh otter trawlers, but substantial landings are also taken by inshore pound nets and fish traps during the spring and summer months (Clark ed. 1998). Only one pilot whale incidental take has been observed in *Loligo* squid fishing operations since 1996. The one take was observed in 1999 in the offshore fishery. No pilot whale takes have been observed in the inshore fishery. Between 1996 and 2001, observer coverage of the fall/winter offshore fishery was .03%, 0.50%, 0.78%, 0.86%, 1.08%, and 1.25%, respectively. Observer coverage of the spring/summer inshore fishery was .02%, 2.10%, 0.47%, 0.51%, 0.59%, and 0.47% between 1996-2001, respectively. The estimated fishery-related mortality of pilot whales attributable to the fall/winter offshore fishery was 0 between 1996 and 1998, 49 in 1999 (CV=0.97), and 0 between 2000 and 2001. The average annual mortality between 1997 and 2001 was 10 pilot whales (CV=0.97) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Atlantic Mackerel

The USA domestic fishery for Atlantic mackerel (*Scomber scombrus*) occurs primarily in the Southern New England and mid-Atlantic waters between the months of January and May (Clark ed. 1998). This fishery is dominated by mid-water (pelagic) trawls. Observer coverage of this fishery was 0.79%, 0.00%, 1.13%, 4.9%, and 3.4% between 1997 and 2001, respectively. No incidental takes of pilot whales have been observed in the domestic mackerel fishery.

A USA joint venture (JV) fishery was conducted in the mid-Atlantic region from February to May 1998. NMFS maintained 100% observer coverage of the foreign joint venture vessels where 152 transfers from the USA vessels were observed. No incidental takes of pilot whales have been observed in the mackerel fishery. The former distant water fleet fishery has been non-existent since 1977. There is also a mackerel trawl fishery in the Gulf of Maine that generally occurs during the summer and fall months (May-December) (Clark ed. 1998). There have been no observed incidental takes of pilot whales reported for the Gulf of Maine fishery.

Southern New England/Mid-Atlantic Mixed Groundfish Trawl Fisheries

This fishery occurs year round, ranging from Cape Cod Massachusetts to Cape Hatteras North Carolina. It represents a variety of individual sub-fisheries that include but are not limited to; monkfish, summer flounder (fluke), winter flounder, silver hake (whiting), spiny and smooth dogfish, scup, and black sea bass. Observer coverage of this fishery was 0.24%, 0.22%, 0.15%, 0.14%, 0.35%, and 0.41% between 1996-2001, respectively. There was one observed take in this fishery reported in 1999. The estimated fishery-related mortality for pilot whales attributable to this fishery was: 0 in 1996-1998, 228 in 1999, and 0 in 2000-2001. The average annual mortality between 1997 and 2001 was 46 pilot whales (CV=1.03) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Northeast Atlantic (Gulf of Maine/Georges Bank) Herring Fishery

Historically, the Atlantic herring resource was harvested by the distant water fleet until the fishery collapsed in the late 1970's. There has been no distant water fleet since the collapse. A domestic fleet has been harvesting the herring resource utilizing both fixed and mobile gears. Only a small percentage of the resource is currently harvested by fixed gear due to a combination of reduced availability and less use of fixed gear (Clark ed. 1998). The majority of the resource is currently harvested by domestic mid-water (pelagic) trawls and (single and paired) purse seines. Atlantic Herring are managed jointly by the MAFMC and ASMFC as one migratory stock complex. There has been a domestic resurgence in a directed fishery on the adult stock due to the recovery of the adult stock biomass. The current fishery occurs during the summer months when the resource is spatially distributed throughout the Gulf of Maine and Georges Bank regions. The stock continues on a southerly migration into mid-Atlantic waters during the winter months. The Atlantic herring mid-water trawl fishery is a Category II fishery and the Atlantic herring purse seine fishery is a Category III fishery. There were no domestic mid-water trawl trips observed in 1997-1998, 3 trips observed in 1999 (1 single; 2 paired), 13 trips in 2000 (12 single; 1 paired), and no trips in 2001. There were no marine mammal takes observed from the domestic mid-water trawl fishing trips during 1997-2001.

A USA joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August - December 2001. A Total Allowable Level of Foreign Fishing (TALFF) was also granted during the same time period. Ten vessels (3 foreign and 7 American), fishing both single and paired mid-water trawls, participated in the 2001 Atlantic herring JV fishery. Two out of the three foreign vessels also participated in the 2001 TALFF and fished with paired mid-water trawls. NMFS maintained 74% observer coverage (243 hauls) of the JV transfers and 100% observer coverage (114 hauls) of the foreign vessels granted a TALFF. Eight pilot whales were incidentally captured in a single mid-water trawl during JV fishing operations. Three pilot whales were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF) (Table 2). The total mortality attributed to the Atlantic herring mid-water trawl fishery in 2001 was 11 animals (Table 2).

Mobile Gear Restricted Areas

Mobile gear restricted areas (GRA's) were put in place for fishery management purposes in November 2000. The intent of the GRA is to reduce bycatch of scup. The GRA's are spread out in time and space along the edge of the Southern New England and mid-Atlantic continental shelf region (between 100-1000 meters). These seasonal closures are targeted at trawl gear with small mesh sizes (<4.5 inches). The Atlantic herring and Atlantic mackerel trawl fisheries are exempt from the GRA's. A temporary exemption was also granted for the *Loligo* squid fishery. For detailed information regarding GRA's refer to FR/Vol. 66, No. 41.

Mid-Atlantic Coastal Gillnet

Observer coverage of the USA Atlantic coastal gillnet fishery was initiated by the NEFSC Sea Sampling Program in July 1993 and from July to December 1993, 20 trips were observed. During 1994 and 1995, 221 and 382 trips were observed, respectively. This fishery, which extends from North Carolina to New York, is actually a combination of small vessel fisheries that target a variety of fish species, some of which operate right off the beach. The number of vessels in this fishery is unknown, because records which are held by both state and federal agencies have not been centralized and standardized. Observer coverage, expressed as percent of tons of fish landed, was 5%, 4%, 3%, 5%, 2%, 2%, and 2% for 1995, 1996, 1997, 1998, 1999, ~~and~~ 2000, and 2001, respectively (Table 2).

No pilot whales were taken in observed trips during 1993-1997. One pilot whale was observed taken in 1998, 0 ~~in 1999 and 2000~~during 1999-2001 (Table 2). Observed effort was ~~concentrated off NJ and~~ scattered between ~~DE~~New York and North Carolina from 1 to 50 miles off the beach. All bycatches were documented during January to April. Using the observed takes, the estimated annual mortality (CV in parentheses) attributed to this fishery was 7 in 1998 (1.1). Average annual estimated fishery-related mortality attributable to this fishery ~~during1996-2000~~between 1997 and 2001 was 1 pilot whale (CV=1.1)

CANADA

An unknown number of pilot whales have also been taken in Newfoundland and Labrador, and Bay of Fundy~~;~~ groundfish gillnets, Atlantic Canada and Greenland salmon gillnets, and Atlantic Canada cod traps (Read 1994). The Atlantic Canadian and Greenland salmon gillnet fishery is seasonal, with the peak from June to September, depending on location. During 1989, in southern and eastern Newfoundland and in Labrador, 2,196 nets 91 m long were used. There are no effort data available for the Greenland fishery; however, the fishery was terminated in 1993 under an agreement between Canada and North Atlantic Salmon Fund (Read 1994).

There were 3,121 cod traps operating in Newfoundland and Labrador during 1979, and about 7,500 in 1980 (Read 1994). This fishery was closed at the end of 1993 due to collapse of Canadian groundfish resources.

Between January 1993 and December 1994, 36 Spanish deep-water trawlers, covering 74 fishing trips (4,726 fishing days and 14,211 sets), were observed in NAFO Fishing Area 3 (off the Grand Banks) (Lens 1997). A total of 47 incidental catches were recorded, which included 1 long-finned pilot whale. The incidental mortality rate for pilot whales was 0.007/set.

In Canada, the fisheries observer program places observers on all foreign fishing vessels, on between 25% and 40% of large Canadian vessels (greater than 100 ft), and on approximately 5% of small vessels (Hooker *et al.* 1997). Fishery observer effort off the coast of Nova Scotia during 1991-1996 varied on a seasonal and annual basis, reflecting changes in fishing effort (see Figure 3, Hooker *et al.* 1997). During the 1991-1996 period, long-finned pilot whales were bycaught (number of animals in parentheses) in bottom trawl (65); midwater trawl (6); and longline (1) gear. Recorded bycatches by year were: 16 in 1991, 21 in 1992, 14 in 1993, 3 in 1994, 9 in 1995, and 6 in 1996. Pilot whale bycatches occurred in all months except January-March and September (Hooker *et al.* 1997).

~~Table 2. Summary of the incidental mortality of pilot whales (*Globicephala sp.*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).~~

~~Fishery~~	~~Years~~	~~Vessels[5]~~	~~Data Type[1]~~	~~Observer Coverage[2]~~	~~Observed Serious Injury~~	~~Observed Mortality~~	~~Estimated Serious Injury~~	~~Estimated Mortality~~	~~Estimated Combined Mortality~~	~~Estimated CVs~~	~~Mean Annual Mortality~~
~~Atlantic[5] squid, mackerel, butterfish trawl~~	~~-96-00 97-01~~	~~NA~~	~~Obs. Data Weighouts~~	~~.007, .008, .003, .004, .007, .008~~	~~0, 0, 0, 0, 0, 0~~	~~6, 0, 1, 1, 1, 0~~	~~0, 0, 0, 0, 0, 0~~	~~45, 0, 85, 49, 34, 0~~	~~45, 0, 85, 49, 34, 0~~	~~1.27, 0, .65, .97, .65, 0~~	~~4334 (.45) (.45)~~

N. Atl. [3] Bottom Trawl	96-00 97-01	NA	Obs. Data Weighouts	.002, .002, .001, .003, .003, .004	0, 0, 0, 0, 0	0, 0, 0, 1, 0, 0	0, 0, 0, 0, 0	0, 0, 0, 228, 0, 0	0, 0, 0, 228, 0, 0	0, 0, 0, 1.03, 0, 0	46 (1.03)
Pelagic [4] Longline	96-00 97-01	253, 245, 205, 193, 186	Obs. Data Logbook	.03, .03, .03, .04, .04, tbd	0, 0, 0, 4, 4, tbd	0, 0, 0, 1, 1, tbd	0, 0, 0, 288, 109, tbd	0, 0, 0, 93, 24, tbd	0, 0, 0, 381, 133, tbd	0, 0, 0, 0.79, .88, tbd	103 (.63) tbd
Mid-Atlantic Coastal Gillnet	96-00 97-01	NA	Obs. Data Weighouts	.04; .03, .05; .02, .02, .02	0, 0, 0, 0, 0	0, 0, 1, 0, 0, 0	0, 0, 0, 0, 0	0, 0, 7, 0, 0, 0	0, 0, 7, 0, 0, 0	0, 0, 1.1; 0, 0, 0	1 (1.1)
Nova Scotia trawl fisheries	1996	NA	Obs. Data	NA	0	6		6		NA	6 (NA)
TOTAL											199 (.43) tbd

[1] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).

[2] Observer coverage of the mid-Atlantic coastal gillnet fishery is measured in tons of fish landed. Observer coverage for the longline fishery are in terms of sets. The trawl fisheries are measured in trips.

[3] In 1997, 1998, and 2000 the observed pilot whales were taken from the *Illex* squid otter trawl sub-fishery. The 1999 observed pilot whales were taken from the *Loligo* squid and N. Atlantic otter trawl subfisheries.

[4] 1996-1998 mortality estimates were taken from Table 9a in Yeung *et al.* (NMFS Miami Laboratory PRD 99/00-13), and excludes the Gulf of Mexico. 1999-2000 mortality estimates were taken from Table 10 in Yeung 2000 (NOAA Technical Memorandum NMFS-SEFSC-467).

[5] Number of vessels in the fishery are based on vessels reporting effort to the pelagic longline logbook.

Table 2. Summary of the incidental mortality of pilot whales (*Globicephala sp.*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels[4]	Data Type [1]	Observer Coverage[2]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
SNE/mid-Atlantic Illex Squid Trawl	97-01	73 [5]	Obs. Data Dealer	.062, .010, .028, .111, NA	0, 0, 0, 0, NA	0, 1, 0, 2, NA	0, 0, 0, 0, 0	0, 85, 0 34, NA	0, 85, 0 34, NA	0, 0.65, 0, 0.65, NA	30 (0.50)
SNE/mid-Atlantic Loligo Squid Trawl (offshore)	97-01	384 [5]	Obs. Data Dealer	.005, .008, .009, .011, .012	0, 0, 0, 0, 0	0, 0, 1, 0, 0	0, 0, 0, 0, 0	0, 0, 49, 0, 0	0, 0, 49, 0, 0	0, 0, 0.97, 0, 0	10 (0.97)
SNE/ mid-Atlantic Bottom Trawl	97-01	NA	Obs. Data Dealer	.002, .001, .003, .003, .004	0, 0, 0, 0, 0	0, 0, 1[6], 0, 0	0, 0, 0, 0, 0	0, 0, 228, 0, 0	0, 0, 228, 0, 0	0, 0, 1.03, 0, 0	46 (1.03)
GOM/GB Herring Mid-Water Trawl JV and TALFF	2001	10[9]	Obs. Data	1.00[7]	0	11	0	11	11	NA	11 (NA)
Pelagic[3] Longline	97-01	245, 205, 193, tbd	Obs. Data Logbook	.03, .03, .04, .04, tbd	0, 0, 4, 4, tbd	0, 0, 1, 1, tbd	0, 0, 288, 109, 79[8]	0, 0, 93, 24, 23[8]	0, 0, 381, 133, 103[8]	0, 0, .79, .88, .33[8]	123 (0.53)

Mid-Atlantic Coastal Gillnet	~~96-00~~ 97-01	NA	Obs. Data Dealer	~~.04,~~ .03, .05, .02, .02, .02	~~0,~~ 0, 0, 0, 0, 0	~~0,~~ 0, 1, 0, 0, 0	~~0~~ 0, 0, 0, 0, 0	~~0,~~ 0, 7, 0, 0, 0	~~0,~~ 0, 7, 0, 0, 0	~~0,~~ 0, 1.1, 0, 0, 0	1 (1.1)
TOTAL											~~199~~ 221 ~~(.43)~~(.36)

[1] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).

[2] Observer coverage of the mid-Atlantic coastal gillnet fishery is measured in tons of fish landed. Observer coverage for the longline fishery are in terms of sets. The trawl fisheries are measured in trips.

[3] 1997-1998 mortality estimates were taken from Table 9a in Yeung *et al.* (NMFS Miami Laboratory PRD 99/00-13), and excludes the Gulf of Mexico. 1999-2000 mortality estimates were taken from Table 10 in Yeung 2000 (NOAA Technical Memorandum NMFS-SEFSC-467).

[4] Number of vessels in the fishery are based on vessels reporting effort to the pelagic longline logbook.

[5] These are numbers of potential fishing vessels based on permit holders in the 2002 fishery. Many of these vessels participate in the other fisheries and therefore the reported number of vessels are not additive across the squid, mackerel and butterfish fisheries. (67FR 65937).

[6] The incidental take was observed on a trip than landed silver hake as the primary species.

[7] During joint venture fishing operations, nets that are transferred from the domestic vessel to the foreign vessels for processing are observed on board the foreign vessel. There may be nets fished by domestic vessels that do not get transferred to a foreign vessel for processing and therefore would not be observed. During TALFF fishing operations all nets fished by the foreign vessel are observed.

[8] Until a complete analysis of marine mammal mortality attributed to the 2001 pelagic long-line fishery is completed, estimates from the previous five years (97-00) were averaged to estimate mortality in 2001.

[9] Three foreign vessels and seven American vessels.

Other Mortality

Pilot whales have a propensity to mass strand throughout their range, but the role of human activity in these events is unknown. Between 2 and 120 pilot whales have stranded annually, either individually or in groups, in NMFS Northeast Region (Anon. 1993b) since 1980. From ~~1992-2000~~1997 to 2001, ~~98 long-finned~~79 pilot ~~whale~~whales (*Globicephala sp.*) have been reported stranded between ~~South Carolina and~~ Maine and Florida (Table 3), including ~~22 and~~ 11 animals that mass stranded in ~~1992 and~~ 2000 ~~, respectively,~~ along the Massachusetts coast (NMFS unpublished data), and 13 animals (in two groups of 5 and 8) along the Florida coast in 1998. Four of 6 animals from one live stranding event in Massachusetts in 2000 were rehabilitated and released. In addition, 11 pilot whales that live stranded on Nantucket were returned to the water. However, certain studies have shown that frequently, animals that are returned to the water swim away and strand someplace else (Fehring and Wells 1976; Irvine *et al.* 1979; Odell *et al.* 1980)

~~In eastern Canada, 37 strandings of long-finned pilot whales (173 individuals) were reported on Sable Island, Nova Scotia from 1970-1998 (Lucas and Hooker 1997; Lucas and Hooker 2000).~~ Short-finned pilot whales (*Globicephala macrorhynchus*) have been reported stranded as far north as Block Island, Rhode Island (2001) and long-finned pilot whales (*Globicephala melas*) as far south as South Carolina. Rarely is there a distinction made between these two species within the U.S. east coast regional stranding records.

In eastern Canada, 37 strandings of long-finned pilot whales (173 individuals) were reported on Sable Island, Nova Scotia from 1970 to 1998 (Lucas and Hooker 1997; Lucas and Hooker 2000). This included 130 animals that mass stranded in December 1976, and 2 smaller groups (<10 each) in autumn 1979 and summer 1992. Fourteen strandings were also recorded along Nova Scotia ~~from~~ in 1991-1996 (Hooker *et al.* 1997).

Table 3. Pilot Whale (*Globicephala sp.*) strandings along the U.S. Atlantic coast 1997-2000. No distinction has been made between short-finned (*Globicephala macrorhynchus*) and long-finned pilot whale (*G. melas*).

State	1997	1998	1999	2000	2001	TOTALS
Maine	1	1	0	0	5	7
New Hampshire	0	0	0	0	0	0
Massachusetts	3	3	6	13	3	28
Rhode Island	0	1	0	0	1	2
Connecticut	0	0	0	0	0	0
New York	0	0	1	1	1	3
New Jersey	1	1	1	0	0	3
Delaware	0	0	0	0	0	0
Maryland	0	0	1	0	0	1
Virginia	1	0	2	0	0	3
North Carolina	0	1	2	0	2	5
South Carolina	0	1	0	0	1	2
Georgia	0	2	0	1	0	3
Florida	2	18	2	0	0	22
TOTALS	8	28	15	15	13	79

[1] Massachusetts mass stranding (11- animals, July 2000)

[2] Florida mass Stranding (5 and 8 animals in 1998)

[3] Fishery Interactions: In Dec. 1998, a pilot whale stranded in Massachusetts contained a 7.25 inch mesh inside its stomach causing peritonitis/tumor abscess. In Dec. 1997, the Coast Guard boarded a vessel 70 miles east of Provincetown, Massachusetts and reported a drowned pilot whale in haul back. (No tissues collected but photos and entanglement log was filled out).

A potential human-caused source of mortality is from polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT, DDE, dieldrin, etc.), moderate levels of which have been found in pilot whale blubber (Taruski 1975; Muir *et al*. 1988; Weisbrod *et al*. 2000). Weisbrod *et al*. (2000) reported that bioaccumulation levels were more similar in whales from the same standing group than animals of the same sex or age. Also, high levels of toxic metals (mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Islands drive fishery (Nielsen *et al*. 2000). Similarly, Dam and Bloch (2000) found very high PCB levels in pilot whales in the Faroes. The population effect of the observed levels of such contaminants is unknown.

STATUS OF STOCK

The status of long-finned pilot whales relative to OSP in US Atlantic EEZ is unknown, but stock abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel, and squid stocks. There are insufficient data to determine the population trends for this species. The species is not listed under the Endangered Species Act. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate.

This is a strategic stock because the~~1996-2000~~ 1997-2001 estimated average annual fishery-related mortality, excluding Nova Scotia bycatches of pilot whales, *Globicephala* sp., exceeds PBR. The status has gone back and forth, because mortality has been close to PBR. In the last five editions of this stock assessment report, it has been designated as non-strategic in 1998 and 1999.

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~~January~~December 2002

WHITE-SIDED DOLPHIN (*Lagenorhynchus acutus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

White-sided dolphins are found in temperate and sub-polar waters of the North Atlantic, primarily on continental shelf waters to the 100 m depth contour. The species inhabits waters from central west Greenland to North Carolina (about 35° N) and perhaps as far east as 43° W (Evans 1987). Distribution of sightings, strandings and incidental takes suggest the possible existence of three stocks units: a Gulf of Maine, ~~a~~ Gulf of St. Lawrence and ~~a~~ Labrador Sea stock (Palka *et al.* 1997). A genetic study is currently being conducted to test this proposed population structure and should be available during 2002. Evidence for a separation between the well documented unit in the southern Gulf of Maine and a Gulf of St. Lawrence population comes from a hiatus of summer sightings along the Atlantic side of Nova Scotia. This has been reported in Gaskin (1992), is evident in Smithsonian stranding records, and was seen during abundance surveys conducted in the summers of 1995 and 1999 that covered waters from Virginia to the entrance of the Gulf of St. Lawrence. White-sided dolphins were seen frequently in eastern Gulf of Maine waters and in waters at the mouth of the Gulf of St. Lawrence, but only a few sightings were recorded in the waters between these two regions.

The Gulf of Maine stock of white-sided dolphins is most common in continental shelf waters from Hudson Canyon (approximately 39°N) north through Georges Bank, and in the Gulf of Maine to the lower Bay of Fundy. Sightings data indicate seasonal shifts in distribution (Northridge *et al.* 1997). During January to April, low numbers of white-sided dolphins are found from Georges Bank to Jeffreys Ledge (off New Hampshire), and even lower numbers are south of Georges Bank, as documented by a few strandings collected on beaches of Virginia and North Carolina. From June through September, large numbers of white-sided dolphins are found from Georges Bank to lower Bay of Fundy. From October to December, white-sided dolphins occur at intermediate densities from southern Georges Bank to southern Gulf of Maine (Payne and Heinemann 1990). Sightings south of Georges Bank, ~~in~~ particularly around Hudson Canyon, have been seen at all times of the year but at low densities. The Virginia and North Carolina observations appear to represent the southern extent of the species range.

Prior to the 1970's, white-sided dolphins in USA waters were found primarily offshore on the continental slope, while white-beaked dolphins (*L. albirostris*) were found on the continental shelf. During the 1970's, there was an apparent switch in habitat use between these two species. This shift may have been a result of the decrease in herring and increase in sand lance in the continental shelf waters (Katona *et al.* 1993; Kenney *et al.* 1996).

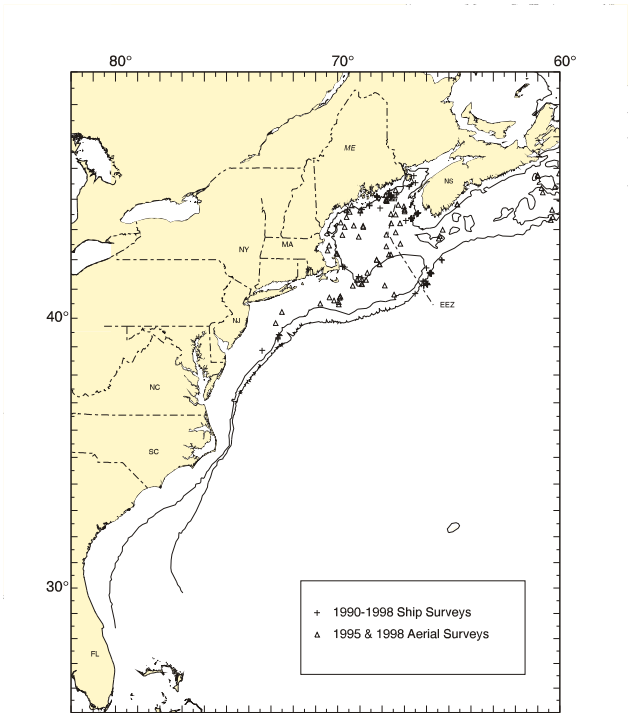

Figure 1. *Distribution of white-sided dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1990-1998. Isobaths are at 100 m and 1,000 m.*

POPULATION SIZE

The total number of white-sided dolphins along the eastern USA and Canadian Atlantic coast is unknown, although five estimates from select regions are available from: 1) spring, summer and

autumn 1978-82; 2) July-September 1991-92; 3) June-July 1993; 4) July-September 1995 (Figure 1); and 5) July-August 1999 (Table 1).

An abundance of 28,600 white-sided dolphins (CV=0.21) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982).

An abundance of 20,400 (CV=0.63) white-sided dolphins was estimated from two shipboard line transect surveys conducted during July to September 1991 and 1992 in the northern Gulf of Maine-lower Bay of Fundy region (Table 1; Palka *et al*. 1997). This population size is a weighted-average of the 1991 and 1992 estimates, where each annual estimate was weighted by the inverse of its variance.

An abundance of 729 (CV=0.47) white-sided dolphins was estimated from a June and July 1993 shipboard line transect sighting survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Table 1; Anon. 1993).

An abundance of 27,200 (CV=0.43) white-sided dolphins was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka*, unpubl. Ms.*). Total track line length was 32,600 km. The ships covered waters between the 50 and 1000 fathom contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom contour line. Data collection and analysis methods used were described in Palka (1996).

An abundance of 51,640 (CV=0.38) white-sided dolphins was estimated from a 28 July to 31 August 1999 line-transect sighting survey conducted from a ship and an airplane covering waters from Georges Bank to the mouth of the Gulf of St. Lawrence (Table 1; Figure 1; D. Palka, pers. comm.). Total track line length was 8,212 km. Using methods sSimilar to that used in the above 1995 survey, shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)* (Palka 2000). The 1999 estimate is larger than the 1995 estimate due to, at least in part, the fact that the 1999 survey covered the upper Bay of Fundy and the northern edge of Georges Bank for the first time and white-sided dolphins were seen in both areas.

Kingsley and Reeves (1998) estimated that there were 11,740 (CV=0.47) white-sided dolphins in the Gulf of St. Lawrence during 1995, and 560 (CV=0.89) white-sided dolphins in the northern Gulf of St. Lawrence during 1996 (Table 1). It is assumed these estimates apply to the Gulf of St. Lawrence stock. During the 1995 survey, 8,427 km of track lines were flown in an area of 221,949 km^2 during August and September. During the 1996 survey, 3,993 km of track lines were flown in an area of 94,665 km^2 during July and August. Data were analyzed using Quenouille's jackknife bias reduction procedure on line transect methods that model the left-truncated sighting curve. These estimates were uncorrected for visibility biases, such as *g(0)*.

The best available current abundance estimate for white-sided dolphins in the Gulf of Maine stock is 51,640 (CV=0.38) as estimated from the July to August 1999 line transect survey because this survey is recent and provided the most complete coverage of the known habitat.

Table 1. Summary of abundance estimates for western North Atlantic white-sided dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Gulf of Maine stock			
Jul-Sep 1991-92	No. Gulf of Maine and lower Bay of Fundy	20,400	0.63
Jun-Jul 1993	Georges Bank to Scotian shelf, shelf edge only	729	0.47
Jul-Sep 1995	Virginia to mouth of Gulf of St. Lawrence	27,200	0.43
Jul-Aug 1999	Georges Bank to mouth of Gulf of St. Lawrence	51,640	0.38
Gulf of St. Lawrence stock			
Aug-Sep 1995	entire Gulf of St. Lawrence	11,740	0.47
July-Aug 1996	northern Gulf of St. Lawrence	560	0.89

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Gulf of Maine stock of white-sided dolphins is 51,640 (CV=0.38). The minimum population estimate for these white-sided dolphins is 37,904 (CV=0.38).

Current Population Trend

There are insufficient data to determine population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity include: calving interval is 2-3 years; lactation period is 18 months; gestation period is 10-12 months and births occur from May to early August, mainly in June and July; length at birth is 110 cm; length at sexual maturity is 230-240 cm for males, and 201-222 cm for females; age at sexual maturity is 8-9 years for males and 6-8 years for females; mean adult length is 250 cm for males and 224 cm for females (Evans 1987); and maximum reported age for males is 22 years and for females, 27 years (Sergeant *et al.* 1980).

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 37,904 (CV=0.38). The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.48 because this stock is of unknown status and the CV of the mortality estimate is between 0.3 and 0.6. PBR for the Gulf of Maine stock of the western North Atlantic white-sided dolphin is 364.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Recently, within USA waters, white-sided dolphins have been observed caught in the Northeast sink gillnet, mid-Atlantic coastal gillnet, ~~pelagic drift gillnet,~~ North Atlantic bottom trawl, and Atlantic squid, mackerel, butterfish trawl fisheries (Table 2). Estimated average annual fishery-related mortality and serious injury to the Gulf of Maine stock of the western North Atlantic white-sided dolphin from these USA fisheries during ~~1996-2000~~1997-2001 was ~~181~~102 (CV=0.~~48~~.56) dolphins per year.

EARLIER INTERACTIONS

In the past, incidental takes of white-sided dolphins have been recorded in the Atlantic foreign mackerel fishery and pelagic drift gillnet fishery. In the mid 1980's, during a University of Maine study, gillnet fishermen reported 6 takes of white-sided dolphins of which 2 carcasses were necropsied for biological studies (Gilbert and Wynne 1987; Gaskin 1992).

Atlantic foreign mackerel

NMFS foreign fishery observers have reported 44 takes of Atlantic white-sided dolphins incidental to fishing activities in the continental shelf and continental slope waters between March 1977 and December 1991 (Waring *et al.* 1990; NMFS unpublished data). Of these animals, 96% were taken in the Atlantic mackerel fishery. This total includes 9 documented takes by USA vessels involved in joint-venture fishing operations in which USA captains transfer their catches to foreign processing vessels. Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the USA. With implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA) in that year, an observer program was established which recorded fishery data and information of incidental bycatch of marine mammals. DWF effort in the USA Atlantic Exclusive Economic Zone (EEZ) under MFCMA had been directed primarily towards Atlantic mackerel and squid. From 1977 through 1982, an average of 120 different foreign vessels per year (range 102-161) operated within the US Atlantic EEZ. In 1982, there were 112 different foreign vessels; 16%, or 18, were Japanese tuna longline vessels operating along the USA east coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. Between 1983 and 1991, the numbers of foreign vessels operating within the US Atlantic EEZ each year were 67, 52, 62, 33, 27, 26, 14, 13 and 9, respectively. Between 1983 and 1988, the numbers of DWF vessels included 3, 5, 7, 6, 8 and 8, respectively, Japanese longline vessels. Observer coverage on DWF vessels was 25-35% during 1977-1982, and increased to 58%, 86%, 95% and 98%, respectively, in 1983-1986. One hundred percent observer coverage was maintained during 1987-91. Foreign fishing operations for squid ceased at the end of the 1986 fishing season and for mackerel at the end of the 1991 season.

Pelagic Drift Gillnet

In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997. The fishery operated during 1998. Then, in January 1999 NMFS issued a Final Rule to prohibit the use of drift net gear in the North Atlantic swordfish fishery (50 CFR Part 630). During 1991 to 1998, 2 white-sided dolphins were observed taken in the Atlantic pelagic drift gillnet fishery, both in 1993. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The estimated total number of hauls in the Atlantic pelagic drift gillnet fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. The estimated number of hauls in 1991 to 1996 were 233, 243, 232, 197, 164 and 149, respectively. Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. In 1994 to 1998, there were 11, 12, 10, 0 and 11 vessels, respectively, in the fishery. Observer coverage, expressed as percent of sets observed was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994, 99% in 1995, 64% in 1996, no fishery in 1997 and 99% coverage during 1998. Observer coverage dropped during 1996 because some vessels were deemed too small or unsafe by the contractor that provided observer coverage to NMFS. Fishing effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras. Examination of the species composition of the catch and locations of the fishery throughout the year, suggest that the drift gillnet fishery is stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of the total bycatch, for each year from 1989 to 1993, were obtained using the aggregated (pooled 1989-1993) catch rates, by stratum~~a~~ (Northridge 1996). Total annual bycatch after 1993 were

estimated for each year separately by summing the observed caught with the product of the average bycatch per haul and the number of unobserved hauls as recorded in logbooks. Variances were estimated using bootstrap re-sampling techniques (Bisack 1997b). Estimated annual fishery-related mortality and serious injury (CV in parentheses) was 4.4 (.71) in 1989, 6.8 (.71) in 1990, 0.9 (.71) in 1991, 0.8 (.71) in 1992, 2.7 (0.17) in 1993 and 0 in 1994 to 1998. There was no fishery during 1997.

USA

Northeast Sink Gillnet

Between 1990 and 200~~0~~1 there were ~~45~~46 mortalities observed in the Northeast sink gillnet fishery ~~(Table 2)~~. The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year this fishery has been covered by the program. In 1993 there were approximately 349 vessels (full and part time) in the Northeast sink gillnet fishery (Walden 1996). During 1998, it was estimated there were 301 full and part-time vessels participating in this fishery. This is the number of unique vessels in the commercial landings database (Weighout) that reported catch from this fishery during 1998 from the states of Rhode Island and north. This does not include a small percentage of records where the vessel number was missing. Observer coverage, expressed as a percentage of the number of trips, has been 1%, 6%, 7%, 5%, 7%, 5%, 4%, 6%, 5%, 6%, 6% and ~~6%~~4% for years 1990 to 200~~0~~1, respectively. Most white-sided dolphins have been taken in waters south of Cape Ann during April to December. In recent years, the majority of the takes have been east and south of Cape Cod. Estimated annual fishery-related mortalities (CV in parentheses) were 49 (0.46) in 1991, 154 (0.35) in 1992, 205 (0.31) in 1993, 240 (0.51) in 1994, 80 (1.16) in 1995, 114 (0.61) in 1996 (Bisack 1997a), 140 (0.61) in 1997, 34 (0.92) in 1998, 69 (0.70) in 1999, 26 (1.00) in 2000 and 26 (1.00) in 200~~0~~1. Average annual estimated fishery-related mortality during ~~1996-2000~~1997-2001 was ~~77~~59 white-sided dolphins per year (0.3~~3~~7) (Table 2).

Mid-Atlantic Coastal Gillnet

One white-sided dolphin was observed taken in this fishery during 1997 (Table 2). None were taken in observed trips during 1993 to 1996, and none during 1998 to 200~~0~~1. In July 1993, an observer program was initiated in the USA mid-Atlantic coastal gillnet fishery by the NEFSC Sea Sampling program. Twenty trips were observed during 1993. During 1994 and 1995, 221 and 382 trips were observed, respectively. This fishery, which extends from North Carolina to New York, is actually a combination of small vessel fisheries that target a variety of fish species. Some of the vessels operate right off the beach with some using drift nets, and others using sink nets attached to the bottom. During 1998, it was estimated that 302 full and part-time sink gillnet vessels and an undetermined number of drift gillnet vessels participated in this fishery. This is the number of unique vessels in the commercial landings database (Weighout) that reported catch from this fishery during 1998 from the states of Connecticut to North Carolina. This does not include a small percentage of records where the vessel number was missing. Observer coverage, expressed as percent of tons of fish landed, was 5%, 4%, 3%, 5%, 2%, 2% and 2% for 1995 to 200~~0~~1, respectively (Table 2). Observed fishing effort was from New York to North Carolina, from the beach to 50 miles off the beach. Bycatch estimates were determined using methods similar to that used for bycatch estimates in the Northeast gillnet fishery (Bravington and Bisack 1996; Bisack 1997a). Using the observed takes of white-sided dolphins, the estimated annual mortality (CV in parentheses) attributed to this fishery was 0 for 1993 to 1996, 0 for 1998 to 200~~0~~1 and 45 (0.82) for 1997. However, because the spatial-temporal distribution of observer coverage did not cover all types of gillnet fisheries in the mid-Atlantic region during all times of the year, it is likely that these figures are under-estimates. Average estimated white-sided dolphin mortality and serious injury from the mid-Atlantic coastal gillnet fishery during 199~~6~~7 to 200~~0~~1 was 9 (CV=0.82) (Table 2).

~~**Squid, Mackerel, Butterfish Trawl**~~

~~One white-sided dolphin was observed taken in the mackerel sub-fishery during 1997 (Table 2). The squid, mackerel, butterfish trawl fishery, though managed under one fishery management plan by the mid-Atlantic Fisheries Management Council, is actually three independent fisheries operating in different areas during different times of the year (NMFS 1998). The Loligo squid sub-fishery is mostly in southern New England, New York and mid-Atlantic waters, where fishing patterns reflect the seasonal migration of the Loligo (offshore during October to March and inshore during April to September). The Illex squid sub-fishery is primarily on the continental slope during June to September. The mackerel sub-fishery during January to May is primarily in the southern New England and mid-Atlantic waters, while during May to December, it is primarily in the Gulf of Maine. Butterfish is primarily a bycatch of the squid and mackerel sub-fisheries. Butterfish migrate north and inshore during the~~

summer, and south and offshore during the winter. In 1995, the squid, mackerel, butterfish trawl fishery was classified as a Category II fishery. Observer coverage was very low. Expressed as percentage of trips observed, it was 0.7% in 1996, 0.8% in 1997, 0.3% in 1998, 0.4% in 1999, and 0.7% in 2000, and 0.8% in 2001. The bycatch, stratified by sub-fishery, season and geographical area, was estimated using the ratio estimator method, as was documented in Bisack (1997b). The estimated fishery-related mortality was 0 in 1996, 161 (CV=1.58) in 1997, and 0 in 1998 to 20001. The average annual estimated fishery-related mortality during 19967 to 20001 was 32 (CV=1.58) (Table 2).

Southern New England/Mid-Atlantic Squid, Mackerel, Butterfish Trawl Fisheries

The mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The mackerel trawl fishery was classified as a Category II fishery since 1990 and the squid fishery was originally classified as a Category II fishery in 1990, but was reclassified as a Category III fishery in 1992. The combined fishery was then reclassified as a Category II fishery in 1995.

In 1996, mackerel, squid, and butterfish trawl fisheries were combined into one Atlantic squid, mackerel, and butterfish fishery management plan and designated as a Category II fishery. Because of spatial and temporal differences in the harvesting of *Illex* and *Loligo* squid, and Atlantic Mackerel, each one of these sub-fisheries are described separately. Butterfish (*Peprilus triacanthus*) undergo a northerly inshore migration during the summer months and southerly offshore migration during the winter months and are mainly caught as incidental bycatch to the directed squid and mackerel fisheries. Fishery observers suggest that a significant amount of butterfish discarding occurs at sea. The *Illex* and *Loligo* squid fisheries are managed by moratorium permits, gear and area restrictions, quotas, and trip limits. The Atlantic mackerel and butterfish fisheries are managed by an annual quota system.

***Illex* Squid**

The USA domestic fishery, ranging from Southern New England to Cape Hatteras North Carolina, reflects patterns in the seasonal distribution of *Illex* squid (*Illex illecebrosus*). *Illex* are harvested offshore (100 m isobath) mainly by small mesh otter trawlers when they are distributed in continental shelf and slope waters during the summer months, June-September (Clark 1998). Annual observer coverage of this fishery has varied widely, and reflect only the months when the fishery is active. Between 1996-2001 annual observer coverage was 3.7%, 6.21%, 0.97%, 2.84%, 11.11% and 0.00%, respectively. No white-sided dolphin takes have been observed taken incidental to *Illex* squid fishing operations since 1996.

***Loligo* Squid**

The USA domestic fishery for *Loligo* squid (*Loligo pealeii*) occurs mainly in Southern New England and mid-Atlantic waters. Fishery patterns reflect *Loligo* seasonal distribution where most effort is directed offshore near the edge of the continental shelf during the fall and winter months (October-March), and inshore during the spring and summer months, April-September (Clark 1998). This fishery is dominated by small-mesh otter trawlers, but substantial landings also are taken by inshore pound nets and fish traps during the spring and summer months (Clark 1998). Between 1996-2001, observer coverage of the fall/winter offshore fishery was 0.03%, 0.50%, 0.78%, 0.86%, 1.08% and 1.25%, respectively. Observer coverage of the spring/summer inshore fishery was 0.02%, 2.10%, 0.47%, 0.51%, 0.59% and 0.47% between 1996-2001, respectively. No white-sided dolphin takes have been observed taken incidental to *Loligo* squid fishing operations since 1996.

Atlantic Mackerel

A recent JV mackerel fishery was conducted in the mid-Atlantic region from February-May 1998. NMFS maintained 100% observer coverage on the foreign joint venture vessels where one hundred and fifty-two transfers from the USA vessels were observed. No incidental takes of white-sided dolphin were observed in Atlantic mackerel JV fishery. There is also an Atlantic mackerel trawl fishery in the Gulf of Maine that generally occurs during the summer and fall months (May-December) (Clark 1998). There have been no observed incidental takes of white-sided dolphins reported for the Gulf of Maine fishery.

The USA domestic fishery for Atlantic mackerel (*Scomber scombrus*) occurs primarily in the Southern New England and mid-Atlantic waters between the months of January and May (Clark 1998). This fishery is prosecuted by both mid-water (pelagic) and bottom trawls. Observer coverage of this fishery was 0.79%, 0.00%, 1.13%, 4.9%, and 3.4% between 1997-2001, respectively. One white-sided dolphin incidental take was observed in 1997. The estimated mortality in 1997 was 161 (CV=1.58) animals (Table 2).

Northeast Atlantic (Gulf of Maine/Georges Bank) Herring Fishery

Historically, the Atlantic herring resource was harvested by distant water fleet until the fishery collapsed in the late 1970's. There has been no distant water fleet since then. A domestic fleet has been harvesting the herring resource utilizing both fixed and mobile gears. Only a small percentage of the resource is currently harvested by fixed gear due to a combination of reduced availability and less use of fixed gear (Clark 1998). The majority of the resource is currently harvested by domestic mid-water (pelagic) trawls (single and paired) and purse seines. Atlantic herring are managed jointly by the MAFMC and ASMFC as one migratory stock complex. There has been a domestic resurgence in a directed fishery on the adult stock due to the recovery of the adult stock biomass. The current fishery occurs during the summer months when the resource is spatially distributed throughout the Gulf of Maine and Georges Bank regions. The stock continues on a southerly migration into mid-Atlantic waters during the winter months. The Atlantic herring mid-water trawl fishery is a category II fishery. The Atlantic herring purse seine fishery is a Category III fishery. There were no domestic mid-water trawl trips observed in 1997-1998, 3 trips in 1999 (1 single; 2 paired), 13 trips in 2000 (12 single; 1 paired), and no trips in 2001. There were no marine mammal takes observed from the domestic mid-water trawl fishing trips during the period 1997-2001.

A USA joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August - December 2001. A total allowable landings of foreign fishery (TALFF) was also granted during the same time period. Ten vessels (3 foreign and 7 American), fishing both single and paired mid-water trawls, participated in the 2001 Atlantic herring JVfishery. Two out of the three foreign vessels also participated in the 2001 TALFF and fished with paired mid-water trawls. The NMFS maintained 74% observer coverage (243 hauls) on the JV transfers and 100% observer coverage (114 hauls) on the foreign vessels granted a TALFF. No white-sided dolphins were incidentally captured in the mid-water trawl during JV fishing operations. Two white-sided dolphins were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF) (Table 2). The total mortality attributed to the Atlantic herring mid-water trawl fishery in 2001 was 2 animals (Table 2).

Mobile Gear Restricted Areas

Mobile gear restricted areas (GRA's) were put in place for fishery management purposes in November 2000. The intent of the GRA's is to reduce bycatch of scup. The GRA's are spread out in time and space along the edge of the Southern New England and mid-Atlantic continental shelf region (between 100-1000 meters). These seasonal closures are targeted at trawl gear with small mesh sizes (<4.5 inches). The Atlantic herring and Atlantic mackerel trawl fisheries are exempt from the GRA's. A temporary exemption was also granted for the *Loligo* squid fishery. For detailed information regarding GRA's refer to FR/Vol. 66, No. 41.

North Atlantic Bottom Trawl

~~Because there have been no observed takes of~~One moderately decomposed ~~white-sided dolphins in this fishery since 1995, this section was moved to the "Earlier Interactions" section~~dolphin was brought up during a monkfish trawl in April 2001 east of Cape Cod. This moderately decomposed animal could not have been killed during this haul because the haul duration was only 4.6 hours. Three mortalities were documented between 1991 and 2001~~0~~ in the North Atlantic bottom trawl fishery; one during 1992 and two during 1994. The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year this fishery has been covered by the program, though at a low level. The observer coverage was 0.4% in 1994, 1.1% in 1995, 0.2% in 1996, 0.2% in 1997, 0.1% in 1998, 0.3% in 1999, 0.4% in 2000, and 0.4% in 2001. Vessels in the North Atlantic bottom trawl fishery, a Category III fishery under the MMPA, were observed in order to meet fishery management needs rather than marine mammal management needs. An average of 970 (CV= 0.04) vessels (full and part time) participated annually in the fishery during 1989-1993. The fishery is active in New England waters in all seasons. The 1 white-sided dolphin taken in 1992 was taken in a haul that was composed of 43% cod, 20% silver hake, and 17% pollock. One of the 1994 takes was in a haul that was composed of 42% white hake, 19% pollock, and 16% monkfish. The other 1994 take was in a haul that kept seven species of which none were dominant. The estimated fishery-related mortality in 1992 was 110 (CV=0.97), in 1994 it was 182 (CV=0.71), and it was 0 in other years (Bisack 1997b). The average annual estimate fishery-related mortality during ~~1996-2000~~1997 to 2001 was 0 white-sided dolphins.

Table 2. Summary of the incidental mortality of white-sided dolphins (Lagenorhynchus acutus) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [1]	Observer Coverage [2]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northeast Sink Gillnet	~~96-00~~ 97-01	1993=349 1998=301	Obs. Data Weighout Trip Logbook	~~.04,~~ .06, .05, .06, .06, .04	~~2[3],~~ 4[3], 1[3], 4[3],1[3], 1[3]	~~114[3],~~ 140[3],34[3], 69[3],26[3], 26[3]	.61,.92, .70,1.00, 1.00	~~77~~59 (0.~~3~~37)
mid-Atlantic Coastal Gillnet	~~96-00~~ 97-01	1998=302[6]	Obs. Data Weighout	~~.04,~~ .03, .05, .02,.02, .02	1 ,0,~~1,~~ 0, 0, 0	45, 0, ~~45,~~ 0, 0, 0	~~0,~~ .82, 0, 0, 0, 0	9 (0.82)
Squid, Mackerel, Butterfish Trawl	~~96-00~~ 97-01	~~Unk~~2,242 [5]	Obs. Data Weighout	~~.007,~~ .008, .003, .004, .0070, .008	1[4], 0, 0,~~0~~ 0, 0	161[4], 0, 0,~~0~~ 0, 0	1.58[4], 0, 0, 0, 0	32 (1.58)
GOM/GB Herring Trawl-TALFF	2001	2[6]	Obs. Data	1.00[6]	2	2	0	2 (0)
Total								1~~8~~02 (.~~48~~56)

[1] Observer data (Obs. Data), used to measure bycatch rates, are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. NEFSC collects landings data (Weighout) which is used as a measure of total effort. Mandatory trip logbook (VTR) (Trip Logbook) data are used to determine the spatial distribution of fishing effort in the sink gillnet fishery.

[2] Observer coverage for the Northeast sink gillnet and both trawl fisheries are measured in trips and the mid-Atlantic coastal gillnet fishery is measured in tons of fish landed.

[3] White-sided dolphins taken before 1997 in observed pinger trips were added directly to the estimated total bycatch for that year. After 1998, a weighted bycatch rate was applied to effort from both pingered and non-pingered hauls within the stratum where white-sided dolphins were observed taken. During the years 1997, 1999 and ~~1999~~2001, respectively, there were 2, 1 and 1 observed white-sided dolphins taken on pingered trips. No takes were observed on pinger trips during 1995, 1996, 1998 and 2000.

[4] The observed take was in the mackerel sub-fishery.

~~[5] Number of vessels is unknown.~~

~~[6] Number of sink gillnet vessels, undetermined number of drift gillnet vessels.~~

[5] These are numbers of potential fishing vessels based on permit holders in the 2002 fishery. Many of these vessels participate in the other fisheries and therefore the reported number of vessels are not additive across the squid, mackerel and butterfish fisheries. (67FR 65937).

[6] Their were two foreign vessels that harvested Atlantic Herring in the US fishery under a TALFF quota. During TALFF fishing operations all nets fished by the foreign vessel are observed.

CANADA

There is little information available which quantifies fishery interactions involving white-sided dolphins in Canadian waters. Two white-sided dolphins were reported caught in groundfish gillnet sets in the Bay of Fundy during 1985 to 1989, and 9 were reported taken in West Greenland between 1964 and 1966 in the now non-operational salmon drift nets (Gaskin 1992). Several (number not specified) were also taken during the 1960's in the now non-operational Newfoundland and Labrador groundfish gillnets. A few were taken in an experimental drift gillnet fishery for salmon off West Greenland which took place from 1965 to 1982 (Read 1994).

Hooker *et al.* (1997) summarized bycatch data from a Canadian fisheries observer program that placed observers on all foreign fishing vessels operating in Canadian waters, on between 25-40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. By-caught marine mammals were noted as weight in kilos rather than by the numbers of animals caught. Thus the number of individuals was estimated by dividing the total weight per species per trip by the maximum recorded weight of each species. During 1991 through 1996, an estimated 6 white-sided dolphins were observed taken. One animal was from a longline trip south of the Grand Banks (43° 10'N 53° 08'W) in November 1996 and the other 5 were taken in the bottom trawl fishery off Nova Scotia in the Atlantic Ocean; 1 in July 1991, 1 in April 1992, 1 in May 1992, 1 in April 1993, 1 in June 1993 and 0 in 1994 to 1996.

Herring Weirs

During the last several years, one white-sided dolphin was released alive and unharmed from a herring weir in the Bay of Fundy (A. Westgate, pers. comm.). Due to the formation of a cooperative program between Canadian fishermen and biologists, it is expected that most dolphins and whales will be able to be released alive.

In USA and Canadian waters, the herring weir fishery occurred from May to ~~September~~October each year along the southwestern shore of the Bay of Fundy, and was scattered along the coasts of western Nova Scotia and northern Maine. In 1990 there were 180 active weirs in western Bay of Fundy (Read 1994). According to Canadian DFO officials, for 1998, there were 225 weir licenses for herring weirs on the New Brunswick and Nova Scotia sides of the Bay of Fundy (60 from Grand Manan Island, 95 from Deer and Campobello Islands, 30 from Passamaquoddy Bay, 35 from East Charlotte area, and 5 from the Saint John area). The number of licenses has been fairly consistent since 1985 (Ed Trippel, pers. comm.), but the number of active weirs is less than the number of licenses, and the number has been decreasing every year, primarily due to competition with salmon mariculture sites (A. Read, pers. comm). Around Grand Manan, there were 25 active weirs in 2001, and 21 in 2002 (H. Koopman, pers. comm). But numbers of weirs for the Nova Scotia shore, Campobello, Deer and the Wolves Islands, or the New Brunswick mainland shore are unknown (H. Koopman, pers. comm).

Other Mortality

USA

Mass strandings involving up to a hundred or more animals at one time are common for this species. From 1968 to 1995, 349 Atlantic white-sided dolphins were known to have stranded on the New England coast (Hain and Waring 1994; Smithsonian stranding records 1996). The causes of these strandings are not known. Because such strandings have been known since antiquity, it could be presumed that recent strandings are a normal condition (Gaskin 1992). It is unknown whether human causes, such as fishery interactions and pollution, have increased the number of strandings. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals which die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

~~During 1997, there were 17 recorded stranded w~~White-sided ~~dolphins, of which 16 died and 1 was released alive (from Rhode Island during February), according to the NE Regional Office/NMFS strandings and entanglement database. One stranding was in Virginia during March, the rest were from Maryland to Maine during January to August, where 10 were from Massachusetts. The cause of death of these strandings were not determined.~~

~~During 1998, there were 88 stranded white-sided dolphins documented~~dolphin stranding records from 1997 to 2001 that are in the NE Regional Office/NMFS strandings and entanglement database~~. One stranding, from Delaware during May, was probably a fishery interaction. The rest of the recorded strandings were from Massachusetts, where 65, 16, 2 and 4 were recorded during January, February, April, May, and November,~~

~~respectively~~ have been reviewed, updated, and reported in Table 3. Cause of death was investigated and it was determined that the only documented human interaction was 1 animal that was possibly killed by a boat collision off Maine during 2001 (Table 3).

Mass strandings in Massachusetts occur frequently (Table 3). There were ~~7~~80 animals ~~found~~ in a mass stranding near Wellfleet, Massachusetts, during the week of 29 January ~~29~~ to 3 February ~~3~~1998. Of these, 2 were released alive. Of the 4 found in Massachusetts during the November 1998 mass stranding, 1 was released alive.

~~During 1999, there were 72 stranded~~ Fifty-three animals stranded in Wellfleet, Massachusetts during 19-24 March 1999.

Stranded white-sided dolphins ~~documented in the NE Regional Office/NMFS stranding and entanglement database. Most were from Massachusetts (66), of which 53 stranded in Wellfleet, MA during 19-24 March 1999. Thirteen white-sided dolphins stranded in New Jersey (May and June), while 1 stranded in each of the following states: Delaware (May), Virginia (April), and Maine (November). Of all 72~~have been released alive. In addition, to those mentioned above, during 1999, of the 70 strandings, 38 were found alive, and 3 of these animals were released alive. ~~It is not known how many strandings, if any, were fishery interactions.~~

~~During 2000, there were 24 stranded white-sided dolphins documented in the NE Regional Office/NMFS stranding and entanglement database. All were from Massachusetts, they were found in March (1), April (7), May (1), August (14), and October (1). Five~~, and during 2000, 5 were found alive (3 in April and 2 in August), and 2 of these were released alive (from August). ~~It is not known how many, if any, were fishery interactions.~~

CANADA

Whales and dolphins stranded during 1991 and 1996 on the coast of Nova Scotia were documented by the Nova Scotia Stranding Network (Hooker *et al.* 1997). Strandings on the beaches of Sable Island during 1970 to 1998 were documented by researchers with Dept. of Fisheries and Oceans (DFO), Canada (Lucas and Hooker 2000). Sable Island is approximately 170 km southeast of mainland Nova Scotia. The white-sided dolphins stranded at nearly all times of the year on the mainland and on Sable Island. On the mainland of Nova Scotia, a total of 34 stranded white-sided dolphins was recorded between 1991 and 1996: 2 in 1991 (August and October), 26 in July 1992, 1 in Nov 1993, 2 in 1994 (February and November), 2 in 1995 (April and August) and 1 in October 1996. During July 1992, 26 white-sided dolphins stranded on the Atlantic side of Cape Breton. Of these 26, 11 were released alive and the rest were found dead. Among the rest of the Nova Scotia strandings, 1 was found in Minas Basin, 2 near Yarmouth and the rest near Halifax. On Sable Island, 10 stranded white-sided dolphins were documented between 1991 and 1998; all were males, 7 were young males (< 200 cm), 1 in January 1993, 5 in March 1993, 1 in August 1995, 1 in December 1996, 1 in April 1997 and 1 in February 1998.

Table 3. Summary of number of stranded white-sided dolphins during January 1, 1997 to December 31, 2001, by state and year.

State	1997	1998	1999	2000	2001	Total
Maine[2]	1		1		2	4
New Hampshire						0
Massachusetts[1]	10	88	65	24	16	203
Rhode Island	1					1
Connecticut						0
New York	2					2
New Jersey			3			3
Delaware						0
Maryland	1	1				2
Virginia	1		1			2
North Carolina						0
TOTAL	16	89	70	24	18	217

[1] Records of mass strandings in Massachusetts included in this table are:
Jan. to Feb 1998 - 80 animals
Nov. 1998 - 4 animals
March 1999 - 53 animals
April 2000 - 5 animals
August 2000 - 11 animals
April 2001 - 6 animals

[2] Strandings that appear to involve a human interaction are:
1 animal from Maine in 2001 that was a possible boat collision.

STATUS OF STOCK

The status of white-sided dolphins, relative to OSP, in the US Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this species. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is a non-strategic stock because estimated average annual fishery-related mortality and serious injury does not exceed PBR.

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~~August 1997~~ December 2002

WHITE-BEAKED DOLPHIN (*Lagenorhynchus albirostris*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

White-beaked dolphins are the more northerly of the two species of *Lagenorhynchus* in the Northwest Atlantic (Leatherwood *et al.* 1976). The species is found in waters from southern New England, north to western and southern Greenland and Davis Straits (Leatherwood *et al.* 1976; CETAP 1982), in the Barents Sea and south to at least Portugal (Reeves *et al.*~~, in press~~ 1999). Differences in skull features indicate that there are at least two separate stocks, one in the eastern and one in the western North Atlantic (Mikkelsen and Lund 1994). No genetic analyses have been conducted to distinguish the stock structure.

In waters off the northeastern U.S. coast, white-beaked dolphin sightings have been concentrated in the western Gulf of Maine and around Cape Cod (CETAP 1982). The limited distribution of this species in U.S. waters has been attributed to opportunistic feeding (CETAP 1982). Prior to the 1970's, white-sided dolphins (*L. acutus*) in U.S. waters were found primarily offshore on the continental slope, while white-beaked dolphins were found on the continental shelf. During the 1970's, there was an apparent switch in habitat use between these two species. This shift may have been a result of the increase in sand lance in the continental shelf waters (Katona *et al.* 1993; Kenney *et al.* 1996).

More recently, during late March of 2001, two groups of white-beaked dolphins stranded on Cape Cod beaches (see Other Mortality section below), and one group of 18 animals was seen about 60 nautical miles east of Provicetown, MA during a NEFSC aerial marine mammal survey (NEFSC unpubl data).

POPULATION SIZE

The total number of white-beaked dolphins in U.S. and Canadian waters is unknown, although one abundance estimate is available for part of the known habitat in U.S. waters, and two estimates are available from Canadian waters (Table 1).

A population size of 573 white-beaked dolphins (CV=0.69) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (Table 1; CETAP 1982). The estimate is based on spring data because the greatest proportion of the population off the northeast U.S. coast appeared in the study area during this season, according to the CETAP data. This estimate does not include a correction for dive-time or g*(0)*, the probability of detecting an animal group on the track line. This estimate may not reflect the current true population size because of its high degree of uncertainty (e.g., large CV), its old age, and it was estimated just after cessation of extensive foreign fishing operations in the region.

A population size of 5,500 white-beaked dolphins was based on an aerial survey off eastern Newfoundland and southeastern Labrador (Table 1; Alling and Whitehead 1987).

A population size of 3,486 white-beaked dolphins (95% confidence interval (CI) = 2,001-4,971) was estimated from a ship-based survey of a small segment of the Labrador Shelf in August 1982 (Table 1; Alling and Whitehead 1987). A CV was not given, but assuming a symmetric CI, it would be 0.22.

There are no abundance estimates for this species in waters between the Gulf of Maine and the Newfoundland/Labrador region.

Table 1. Summary of abundance estimates for western North Atlantic white-beaked dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV). Unk=unknown.

Month/Year	Area	N_{best}	CV
spring 1978-82	Cape Hatteras, NC to Nova Scotia	573	0.69
1980's	E. Newfoundland and SE Labrador	5,500	None reported
August 1982	Labrador shelf	3,486	0.22

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate in U.S. Exclusive Economic Zone (EEZ) waters.

Current Population Trend

There are insufficient data to determine population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (Wade and Angliss 1997). The minimum population size of white-beaked dolphins is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic white-beaked dolphin is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

White-beaked dolphins have been taken in cod traps and the Canadian groundfish gillnet fisheries off Newfoundland and Labrador and in the Gulf of St. Lawrence (Alling and Whitehead 1987; Read 1994; Hai *et al.* 1996); however, the total number of animals taken is not known. Of three by-caught white-beaked dolphins reported off Newfoundland during 1987-1988, one died in a groundfish gill net, one in a herring gill net, and one in a cod trap (Reeves *et al.* 1999).

There are no documented reports of fishery-related mortality or serious injury to this stock in the U.S. EEZ.

Fishery Information

Because of the absence of observed fishery-related mortality and serious injury to this stock in the U.S. ~~EEZ~~and Canadian waters, no ~~U.S.~~ fishery information is provided.

~~The Canadian Atlantic groundfish gillnet fishery is important and widespread. Many fisherman hold groundfish gillnet licenses but the number of active fishermen is unknown. In 1989, approximately 6,800 licenses were issued to fishermen along the southern coast of Labrador, and northeast and southern coast of Newfoundland. About 3,900 licenses were issued in 1989 in the Gulf of St. Lawrence and 659 licenses were issued in the Bay of Fundy and southwestern Nova Scotia.~~

Other Mortality

White-beaked dolphins were hunted for food by residents in Newfoundland and Labrador (Alling and Whitehead 1987). These authors, based on interview data, estimated that 366 white-beaked dolphins were taken each year. The same authors reported that 25-50% of the killed dolphins were lost. Hunting that now occurs in Canadian waters is believed to be opportunistic and in remote regions of Labrador where enforcement of regulations is minimal (Lien *et al.* 2001).

White-beaked dolphins regularly become caught in ice off the coast of Newfound during years of heavy pack ice. A total of 21 ice entrapments involving approximately 350 animals were reported in Newfoundland from 1979 to 1990; known mortality as a result of entrapment was about 55% (Lien *et al.* 2001).

Mass strandings of white-beaked dolphins are less common than for white-sided dolphins. White-beaked dolphins more commonly strand as individuals or in small groups (Reeves *et al.* 1999). In Newfoundland, five strandings of white-beaked dolphins between 1979 and 1990 involved groups of two to seven animals. On three occasions live dolphins came ashore, including groups of three and four (Reeves *et al.* 1999).

White-beaked dolphin stranding records from 1997 to 2001 that are in the NE Regional Office/NMFS strandings and entanglement database include three records that clearly identify the species to be the white-beaked dolphin. All these strandings were collected from Cape Cod, Massachusetts beaches , where one animal stranded during May 1997, and two animals stranded during March 2001. Samples from the two 2001 strandings have been archived. It was not possible to determine the cause of death for any of these stranded animals.

STATUS OF STOCK

The status of white-beaked dolphins, relative to OSP, in U.S. Atlantic coast waters is unknown. They are not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this species. Because there are insufficient data to calculate PBR it is not possible to determine if stock is strategic and if the total fishery-related mortality and serious injury for this stock is significant and approaching zero mortality and serious injury rate. However, because this stock has a marginal occurrence in U.S. waters and there are no documented takes in U.S. waters, this stock has been designated as not strategic.

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COMMON DOLPHIN (*Delphinus delphis*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The common dolphin may be one of the most widely distributed species of cetaceans, as it is found worldwide in temperate, tropical, and subtropical seas. In the North Atlantic, common dolphins appear to be present along the coast over the continental shelf along the 200-2000m isobaths or over prominent underwater topography from 50° N to 40°S latitude (Evans 1994). The species is less common south of Cape Hatteras, although schools have been reported as far south as eastern Florida (Gaskin 1992). At least some of the reported sightings of common dolphins in the Gulf of Mexico may have been *Stenella clymene*, which has a color pattern similar to that of common dolphins (Evans 1994). NMFS is currently funding genetic and skull morphometric studies, which will provide information on common dolphin stock structure in the western North Atlantic. Preliminary work had documented a high variance in skull morphometric measurements, suggesting the existence of more than a single stock (J. G. Mead, pers. comm.). Common dolphins are distributed along the continental slope (100 to 2,000 meters), and are associated with Gulf Stream features in waters off the northeastern USA coast (CETAP 1982; Selzer and Payne 1988; Waring *et al.* 1992). They are widespread from Cape Hatteras northeast to Georges Bank (35° to 42° North latitude) in outer continental shelf waters from mid-January to May (Hain *et al.* 1981; CETAP 1982; Payne *et al.* 1984). Common dolphins move northward onto Georges Bank and the Scotian Shelf from mid-summer to autumn (Palka *et al.* Unpubl. MS). Selzer and Payne (1988) reported very large aggregations (greater than 3,000 animals) on Georges Bank in autumn. Common dolphins are rarely found in the Gulf of Maine, where temperature and salinity regimes are lower than on the continental slope of the Georges Bank/mid-Atlantic region (Selzer and Payne 1988). Migration onto the Scotian Shelf and continental shelf off Newfoundland occurs during summer and autumn when water temperatures exceed 11°C (Sergeant *et al.* 1970; Gowans and Whitehead 1995).

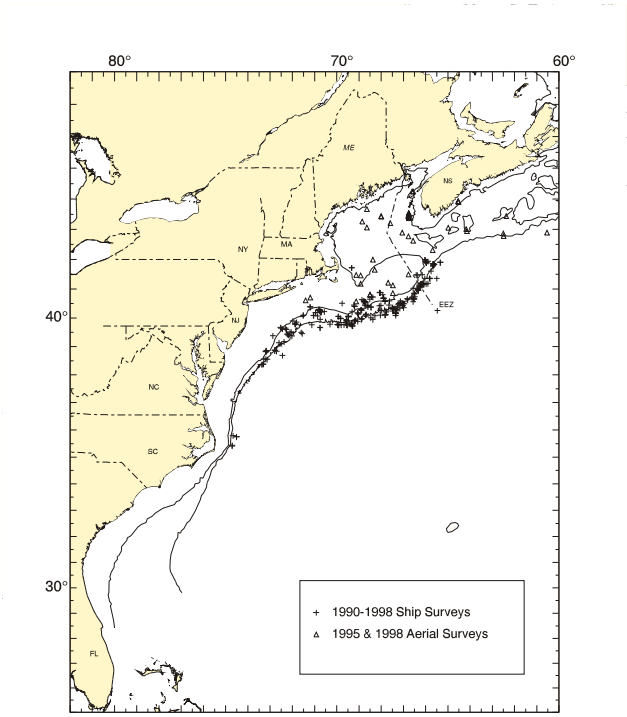

Figure 1. *Distribution of common dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1990-1998. Isobaths are at 100 m and 1,000 m.*

POPULATION SIZE

Total numbers of common dolphins off the USA or Canadian Atlantic coast are unknown, although five estimates from selected regions of the habitat do exist for selected time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas (Figure 1). An abundance of 29,610 common dolphins (CV=0.39) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982). An abundance of 22,215 (CV=0.40) common dolphins was estimated from a June and July 1991 shipboard line-transect sighting survey conducted primarily between the 200 and 2,000m isobaths from Cape Hatteras to Georges Bank (Waring *et*

al. 1992; Waring 1998). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, therefore should not be used for PBR determinations. Further, due to changes in survey methodology these data should not be used to make comparisons to more current estimates.

An abundance of 1,645 (CV=0.47) common dolphins was estimated from a June and July 1993 shipboard line-transect sighting survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Anon. 1993). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993). Estimates include school size-bias, if applicable, but do not include corrections for *g(0)* or dive-time. Variability was estimated using bootstrap resampling techniques.

An abundance of 6,741 (CV=0.69) common dolphins was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka *et al.* Unpubl. MS). Total track line length was 32,600 km. The ships covered waters between the 50 and 1000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom ~~depth contour line~~isobath. Data collection and analysis methods used were described in Palka (1996).

An abundance of 30,768 (CV=0.32) common dolphins was estimated from a line transect sighting survey conducted during July 6 to September 6, 1998 by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38° N) (Figure 1; Palka *et al.* Unpubl. MS). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

No common dolphins were encountered during the SEFSC component of the joint surveys. That shipboard line transect sighting survey was conducted between 8 July and 17 August 1998 and surveyed 5,570 km of track line in waters south of Maryland (38°N) (Mullin in press).

Although the 1991, 1993, 1995, and 1998 surveys did not sample the same areas or encompass the entire common dolphin habitat (e.g., little effort in Scotian shelf edge waters), they did focus on segments of known or suspected high-use habitats off the northeastern USA coast. The 1993, 1995 and 1998 data suggest that, seasonally, at least several thousand common dolphins are occupying continental shelf edge waters, with perhaps highest abundance in the Georges Bank region.

The best available abundance estimate for common dolphins is 30,768 (CV=0.32) as estimated from the July 6 to September 6, 1998 USA Atlantic surveys. This estimate is considered best because these surveys have the most complete coverage of the species' habitat. The previous best estimate of 22,215 (CV=0.40) is nearly eight years old.

Table 1. Summary of abundance estimates for western North Atlantic common dolphin. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Sep 1995	Virginia to Gulf of St. Lawrence	6,741	0.69
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	30,768	0.32

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for common dolphins is 30,768 (CV=0.32). The minimum population estimate for the western North Atlantic common dolphin is 23,655 (CV=0.32).

Current Population Trend

There are insufficient data to determine the population trends for this species.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 23,655 (CV=0.32). The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.48 because the CV of the average mortality estimate is between 0.3 and 0.6 (Wade and Angliss 1997), and because this stock is of unknown status. PBR for the western North Atlantic common dolphin is 227.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total annual estimated average fishery-related mortality or serious injury to this stock during ~~1996-2000~~1997-2001 was ~~375~~190 common dolphins (~~CV=0.40~~CV=0.30; Table 2).

Fishery Information

USA

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the USA. With implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA), an observer program was established which has recorded fishery data and information of incidental bycatch of marine mammals. DWF effort in the Atlantic coast Exclusive Economic Zone (EEZ) under MFCMA has been directed primarily towards Atlantic mackerel and squid. From 1977 through 1982, an average of 120 different foreign vessels per year (range 102-161) operated within the US Atlantic EEZ. In 1982, there were 112 different foreign vessels; 16%, or 18, were Japanese tuna longline vessels operating along the USA east coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. Between 1983 and 1991, the numbers of foreign vessels operating within the US Atlantic EEZ each year were 67, 52, 62, 33, 27, 26, 14, 13 and 9, respectively. Between 1983 and 1988, the numbers of DWF vessels included 3, 5, 7, 6, 8 and 8, respectively, Japanese longline vessels. Observer coverage on DWF vessels was 25-35% during 1977-1982, and increased to 58%, 86%, 95% and 98%, respectively, in 1983-1986. From 1987 to 1991, 100% observer coverage was maintained. Foreign fishing operations for squid and mackerel ceased at the end of the 1986 and 1991 fishing seasons, respectively.

During the period 1977-1986, observers recorded 123 mortalities in foreign *Loligo* squid-fishing activities (Waring *et al*. 1990). In 1985 and 1986, Italian vessels took 56 and 54 animals, respectively, which accounts for 89% (n=110) of the total takes in foreign *Loligo* squid-fishing operations. No mortalities were reported in foreign *Illex* squid fishing operations. Because of spatial/temporal fishing restrictions, most of the bycatch occurred along the continental shelf edge (100 m) isobath during winter (December to February).

From 1977 to 1991, observers recorded 110 mortalities in foreign mackerel-fishing operations (Waring *et al*. 1990; NMFS unpublished data). This total includes one documented take by a USA vessel involved in joint-venture fishing operations in which USA captains transfer their catches to foreign processing vessels. The bycatch occurred during winter/spring (December to May).

Data on current incidental takes in USA fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year several fisheries have been covered by

the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) and provides observer coverage of vessels fishing south of Cape Hatteras.

Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet, pelagic pair trawl, pelagic longline ~~fishery~~, mid-Atlantic coastal gillnet, North Atlantic bottom trawl, Northeast multispecies sink gillnet, and Atlantic squid, mackerel, butterfish trawl fisheries.

Pelagic Drift Gillnet

The estimated total number of hauls in the pelagic drift gillnet fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. The estimated number of hauls in 1991, 1992, 1993, 1994, 1995, 1996 and 1998 were 233, 243, 232, 197, 164, 149 and 113 respectively. In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997. Further, in January 1999 NMFS issued a Final Rule to prohibit the use of driftnets (*i.e.*, permanent closure) in the North Atlantic swordfish fishery (50 CFR Part 630). Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. From 1994 to 1998, between 10 and 13 vessels ~~have~~ participated in the fishery. Observer coverage, expressed as percent of sets observed, was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994, 99% in 1995, 64% in 1996 and 99% in 1998. Effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras. Examination of the species composition of the catch and locations of the fishery throughout the year, suggested that the pelagic drift gillnet fishery be stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of the total bycatch, from 1989 to 1993, were obtained using the aggregated (pooled 1989-1993) catch rates, by stratum (Northridge 1996). Estimates of total annual bycatch for 1994 and 1995 were estimated from the sum of the observed caught and the product of the average bycatch per haul and the number of unobserved hauls as recorded in self-reported fisheries information. Variances were estimated using bootstrap re-sampling techniques. Eight hundred and sixty-one common dolphin mortalities were observed between 1989 and 1998 in this fishery. Mortalities were observed in all seasons and areas. Seven animals were released alive, but 6 were injured. Estimated annual mortality and serious injury attributable to this fishery (CV in parentheses) was 540 in 1989 (0.19), 893 in 1990 (0.18), 223 in 1991 (0.12), 227 in 1992 (0.09), 238 in 1993 (0.08), 163 in 1994 (0.02), 83 in 1995 (0), 106 in 1996 (0.07) and 255 in 1998 (0). Since this fishery no longer exists, it has been excluded from Table 2 (see Waring *et al*. 1999).

Pelagic Pair Trawl

~~Effort in the~~ The pelagic pair trawl fishery ~~increased during the period 1989 to 1993, from zero hauls in 1989 and 1990, to~~ operated as an experimental fishery from 1991 to 1995, with an estimated 171 hauls in 1991, ~~and then to an estimated~~ 536 ~~hauls~~ in 1992, 586 in 1993, 407 in 1994 and 440 in 1995. This fishery ceased operations in 1996, when NMFS rejected a petition to consider pair trawl gear as an authorized gear type in the Atlantic tuna fishery. The fishery operated in August to November in 1991, from June to November in 1992, from June to October in 1993 (Northridge 1996), and from mid-summer to December in 1994 and 1995. Sea sampling began in October of 1992 (Gerrior *et al*. 1994) where 48 sets (9% of the total) were sampled. In 1993, 102 hauls (17% of the total) were sampled. In 1994 and 1995, 52% (212) and 55% (238), respectively, of the sets were observed. Nineteen vessels have operated in this fishery. The fishery operates in the area between 35°N to 41°N and 69°W to 72°W. Approximately 50% of the total effort was within a one degree square at 39°N, 72°W, around Hudson Canyon from 1991 to 1993. Examination of the 1991-1993 locations and species composition of the bycatch, showed little seasonal change for the six months of operation and did not warrant any seasonal or areal stratification of this fishery (Northridge 1996). Twelve mortalities were observed between 1991 and 1995. The estimated annual fishery-related mortality and serious injury attributable to this fishery (CV in parentheses) was 5.6 in 1991 (0.53), 32 in 1992 (0.48), 35 in 1993 (0.43), 0 in 1994 and 5.6 in 1995 (0.35). Since this fishery is no longer in operation it has been deleted from Table 2. During the 1994 and 1995 experimental pelagic pair trawl fishing seasons, fishing gear experiments were conducted to collect data on environmental parameters, gear behavior, and gear handling practices to evaluate factors affecting catch and bycatch (Goudey 1995, 1996), but the results were inconclusive. ~~Results of these studies have been presented at Offshore Cetacean Take Reduction Team Meetings.~~

Pelagic Longline

Total effort, excluding the Gulf of Mexico and fishing regions east of 60°W longitude, for the pelagic longline fishery, based on mandatory self-reported fisheries information, was 11,279 sets in 1991, 8,579 sets in 1992, 8,644 sets in 1993, 9,191 sets in 1994, 9,124 sets in 1995, 7,818 sets in 1996, 7,707 sets in 1997, 6,305 sets

in 1998, 5,832 sets in 1999 and 6,582 in 2000 (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999a; Yeung *et al*. 2000; Yeung 2001). Since 1992, this fishery has been monitored with about 5% observer coverage, in terms of trips observed, within every statistical reporting area within the US Atlantic EEZ and beyond. Off the USA Atlantic coast, the fishery has been observed from January to March off Cape Hatteras, in May and June in the entire mid-Atlantic, and in July through December in the mid-Atlantic Bight and off Nova Scotia. The 1994-1998 estimated take was based on a revised analysis of the observed incidental take and self-reported incidental take and effort data, and replace previous estimates for the 1992-1993 and 1994-1995 periods (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999). Further, Yeung (1999b) revised the 1992-1997 fishery mortality estimates in Johnson *et al.* (1999) to include seriously injured animals. The 1998 bycatch estimates were from Yeung (1999a). Most of the estimated marine mammal bycatch was from US Atlantic EEZ waters between South Carolina and Cape Cod (Johnson *et al.* 1999). Between 1990 and 2000 sixteen common dolphins were hooked and released alive (Yeung *et al*. 2000; Yeung 2001).

Northeast Multispecies Sink Gillnet

In 1993, there were approximately 349 full and part-time vessels in the Northeast multispecies sink gillnet fishery, which covered the Gulf of Maine and southern New England (Table 2). An additional 187 vessels were reported to occasionally fish in the Gulf of Maine with gillnets for bait or personal use; however, these vessels were not covered by the observer program (Walden 1996) and their fishing effort was not used in estimating mortality. Observer coverage in terms of trips has been 1%, 6%, 7%, 5%, 7%, 5%, 4%, 6%, 5%, 6%, 6% and ~~6%~~4% for 1990 to ~~2000~~2001 respectively. The fishery has been observed in the Gulf of Maine and in Southern New England. In 1996, the first observed mortality of common dolphins in this fishery was recorded. The estimated annual fishery-related mortality and serious injury attributable to this fishery (CV in parentheses) was 0 in 1995, 63 in 1996 (CV=1.39), 0 in 1997, 0 in 1998, 146 in 1999 (0.97) and 0 in both 2000 and 2001; estimated annual mortality (~~1996-2000~~1997-2001) was ~~42~~29 common dolphins (CV= ~~0.78~~0.97) (Table 2). ~~Annual estimates of common dolphin bycatch in the Northeast multispecies sink gillnet fishery reflect seasonal distribution of the species and of fishing effort.~~

Mid-Atlantic Coastal Gillnet

Observer coverage of the USA Atlantic coastal gillnet fishery was initiated by the NEFSC Sea Sampling program in July, 1993; and from July to December 1993, 20 trips were observed. During 1994 and 1995, 221 and 382 trips were observed, respectively. This fishery, which extends from North Carolina to New York, is actually a combination of small vessel fisheries that target a variety of fish species, some of which operate right off the beach. The number of vessels in this fishery is unknown, because records which are held by both state and federal agencies have not been centralized and standardized. Observer coverage, expressed as percent of tons of fish landed, was 5%, 4%, 3%, 5%, 2%, 2% and 2% for 1995, 1996, 1997, 1998, 1999, ~~and~~ 2000 and 2001, respectively (Table 2).

No common dolphins were taken in observed trips during 1993 and 1994. Two common dolphins were observed taken in 1995, 1996, and 1997, and no takes were observed from 1998-~~2000~~2001 (Table 2). Observed effort was concentrated off New Jersey and scattered between Delaware and North Carolina from 1 to 50 miles off the beach. All bycatches were documented during January to April. Using the observed takes, the estimated annual mortality (CV in parentheses) attributed to this fishery was 7.4 in 1995 (CV=0.69), 43 in 1996 (0.79), 16 in 1997 (0.53), and 0 in ~~1998-2000~~1998-2001. Average annual estimated fishery-related mortality attributable to this fishery during ~~1996-2000~~1997-2001 was ~~12~~3 common dolphins (~~CV=0.59~~CV=0.53).

~~**North Atlantic Bottom Trawl**~~

~~Vessels in the North Atlantic bottom trawl fishery, a Category III fishery under MMPA, were observed in order to meet fishery management needs, rather than marine mammal management needs. An average of 970 vessels (full and part time) participated annually in the fishery during 1991-1995. The fishery is active in all seasons in New England waters. Four mortalities were observed between 1991-2000~~1991 and 2001. ~~Observer coverage, expressed as number of trips, was < 1% from 1996-2000~~1997 to 2001 ~~(Table 2). The estimated annual fishery-related mortality and serious injury attributable to this fishery (CV in parentheses) was 0~~ 0 ~~in 1991, 0 in 1992, 0 in 1993, 0 in 1994~~1991-1994~~, 142 in 1995 (0.77), 0 in 1996, 93 in 1997 (1.06), and 0 in 1998, 1999 and 2000~~0 in 1998-2001. ~~Average annual estimated fishery-related mortality attributable to this fishery during 1996-~~

~~20001997-2001 was 19 common dolphins (CV=1.06) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.~~

~~**Squid, Mackerel, Butterfish Trawl**~~

~~The mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The fishery occurs along the USA mid-Atlantic continental shelf region between New Brunswick, Canada, and Cape Hatteras year around. The mackerel trawl fishery was classified as a Category II fishery in 1990 and the squid fishery was originally classified as a Category II fishery in 1990, but was reclassified as a Category III fishery in 1992. The combined fishery was reclassified as a Category II fishery in 1995. In 1996, mackerel, squid, and butterfish trawl fisheries were combined into the Atlantic squid, mackerel, and butterfish trawl fishery, and maintained a Category II classification. Observer coverage, expressed as number of trips, was < 1% from 1996 to 2000 (Table 2). Three common dolphin mortalities were observed in 1996, 1 in 1997, 0 in 1998, 1 in 1999, and 6 in 2000, and 2 in 2001 (Table 2). The 1996, 2000, and 2001 mortalities were in the *Loligo* squid sub-fishery, and the 1997 mortality occurred in the Atlantic mackerel sub-fishery. The estimated annual fishery-related mortality and serious injury attributable to this fishery (CV in parentheses) was 940 in 1996 (0.75), 161 in 1997 (0.49), 0 in 1998, 49 in 1999 (0.78), and 235 in 2000 (0.57), and 126 (1.09) in 2001. Average annual estimated fishery-related mortality attributable to this fishery during 1996-20001997-2001 was 285122 common dolphins (CV= 0.510.37) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage and uncertainties regarding number of vessels participating in this "fishery".~~

~~**Mackerel Joint Venture**~~

~~A USA joint venture fishery was conducted in the mid-Atlantic region from February to May 1998. NMFS maintained 100% observer coverage on the foreign joint-venture vessels. One hundred and fifty-two transfers from the USA vessels were observed. Seventeen common dolphin mortalities were observed in March. The principal fish species in the transferred trawl nets and number of bycaught animals (in parentheses) were: squid (11), butterfish (4), and mackerel (2). Average annual estimated fishery-related mortality attributable to this fishery in 1998 was 17 common dolphins (CV=0) (Table 2). This fishery did not operate in 1999-2001.~~

Southern New England/Mid-Atlantic Squid, Mackerel, Butterfish Trawl Fisheries

In 1996, mackerel, squid, and butterfish trawl fisheries were combined into one Atlantic squid, mackerel, and butterfish fishery management plan and designated as a Category II fishery. Because of spatial and temporal differences in the harvesting of *Illex* and *Loligo* squid, and Atlantic Mackerel, each one of these sub-fisheries are described separately. Butterfish (*Peprilus triacanthus*) undergo a northerly inshore migration during the summer months and southerly offshore migration during the winter months and are mainly caught as incidental bycatch to the directed squid and mackerel fisheries. Fishery observers suggest that a significant amount of butterfish discarding occurs at sea. The *Illex* and *Loligo* squid fisheries are managed by moratorium permits, gear and area restrictions, quotas, and trip limits. The Atlantic mackerel and butterfish fisheries are managed by an annual quota system.

Historically, the mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The mackerel trawl fishery was classified as a Category II fishery since 1990 and the squid fishery was originally classified as a Category II fishery in 1990, but was reclassified as a Category III fishery in 1992. The combined fishery was then reclassified as a Category II fishery in 1995.

***Illex* Squid**

The USA domestic fishery, ranging from Southern New England to Cape Hatteras North Carolina, reflects patterns in the seasonal distribution of *Illex* squid (*Illex illecebrosus*). *Illex* are harvested offshore mainly by small mesh otter trawlers when they are distributed in continental shelf and slope waters during the summer months (June-September)(Clark ed. 1998). No incidental takes of common dolphins have been observed in the *Illex* fishery. Annual observer coverage of this fishery has varied widely and reflect only the months when the fishery is active. Between 1996-2001 annual observer coverage was 3.7%, 6.21%, 0.97%, 2.84%, 11.11% and 0.00%, respectively.

***Loligo* Squid**

The USA domestic fishery for *Loligo* squid (*Loligo pealeii*) occurs mainly in Southern New England and mid-Atlantic waters. Fishery patterns reflect *Loligo* seasonal distribution where most effort is directed offshore near the edge of the continental shelf during the fall and winter months (October-March), and inshore during the spring and summer months (April-September) (Clark ed. 1998). This fishery is dominated by small-mesh otter trawlers, but substantial landings also are taken by inshore pound nets and fish traps during the spring and summer months (Clark ed. 1998). All incidental takes attributed to this fishery were observed during the first quarter of the year (Jan-Mar), exclusively in the offshore fishery. Between 1996-2001, observer coverage of the fall/winter offshore fishery was .03%, 0.50%, 0.78%, 0.86%, 1.08% and 1.25%, respectively. Observer coverage of the spring/summer inshore fishery was .02%, 2.10%, 0.47%, 0.51%, 0.59% and 0.47% between 1996-2001, respectively. The estimated fishery-related mortality of common dolphins attributable to the fall/winter offshore fishery was 0 between 1997-1998, 49 in 1999 (CV=0.97), 273 in 2000 (CV=0.57) and 126 in 2001 (CV=1.09). The average annual mortality between 1997-2001 was 90 common dolphins (CV=0.47) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Atlantic Mackerel

The USA domestic fishery for Atlantic mackerel (*Scomber scombrus*) occurs primarily in the southern New England and mid-Atlantic waters between the months of January and May (Clark ed. 1998). This fishery is dominated by mid-water (pelagic) trawls. Observer coverage of this fishery was 0.79%, 0.00%, 1.13%, 4.9% and 3.4% between 1997-2001, respectively. One common dolphin take was observed in 1997. The estimated fishery-related mortality attributed to this fishery was 161 (CV=0.49) animals in 1997, and 0 between 1998-2001. The average annual mortality between 1997-2001 was 32 common dolphins (CV=0.49) (Table 2).

A USA joint venture (JV) fishery was conducted in the mid-Atlantic region from February-May 1998. NMFS, maintained 100% observer coverage on the foreign JV vessels where one hundred and fifty-two transfers from the USA vessels were observed. Seventeen incidental takes of common dolphin were observed in the 1998 JV mackerel fishery. This fishery did not operate in 1999-2001. The former distant water fleet fishery has been non-existent since 1977. There is also a mackerel trawl fishery in the Gulf of Maine that generally occurs during the summer and fall months (May-December) (Clark ed. 1998).

Southern New England/Mid-Atlantic Mixed Groundfish Trawl Fisheries

This fishery occurs year round ranging from Cape Cod Massachusetts to Cape Hatteras North Carolina. It represents a variety of individual sub-fisheries that include but are not limited to; monkfish, summer flounder (fluke), winter flounder, silver hake (whiting), spiny and smooth dogfish, scup, and black sea bass. Observer coverage of this fishery was 0.24%, 0.22%, 0.15%, 0.14%, 0.35% and 0.41% between 1996-2001, respectively. There was one observed take in this fishery reported in 1997. The estimated fishery-related mortality for common dolphins attributable to this fishery was 93 (CV=1.06) animals in 1997 and 0 between 1998-2001. The average annual mortality between 1997-2001 was 19 common dolphins (CV=1.06) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

CANADA

Between January 1993 and December 1994, 36 Spanish deep water trawlers, covering 74 fishing trips (4,726 fishing days and 14,211 sets), were observed in NAFO Fishing Area 3 (off the Grand Banks) (Lens 1997). A total of 47 incidental catches were recorded, which included 1 common dolphin. The incidental mortality rate for common dolphins was 0.007/set.

Table 2. Summary of the incidental mortality of common dolphins (*Delphinus delphis*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [1]	Observed Serious Injury	Observer Coverage [2]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northeast Multispecies Sink Gillnet	96-00 97-01	349	Obs. Data Weighout, Logbooks	0, 0, 0, 0, 0	.04, .06, .05, .06, .06, .04	1, 0, 0, 2, 0, 0	63, 0, 0, 146, 0, 0	1.39, 0, 0 .97, 0, 0	42 29 (.78) (.97)
mid-Atlantic Coastal Gillnet	96-00 97-01	NA	Obs. Data Weighout	0, 0, 0, 0, 0	.04, .03, .05, .02, .02, .02	2, 2, 0, 0, 0, 0	43, 16, 0, 0, 0, 0	.79, .53, 0, 0, 0, 0	12 3 (.59) (.53)
Atlantic squid, mackerel, butterfish trawl	96-00 97-01	NA	Obs. Data Weighout	0, 0, 0, 0, 0	.007, .008, .003, .004, .007, .008	3 [3], 1 [3], 0, 1 [3], 6 [3], 2 [3]	940, 161, 0, 49, 273, 126	.75, .49, 0, .78, .57 1.09	285122 (.51) (.37)
North Atlantic Bottom Trawl	96-00 97-01	970	Obs. Data Weighout	0, 0, 0, 0, 0	.002, .002, .001, .003, .003, .004	0, 1, 0, 0, 0, 0	0, 93, 0, 0, 0, 0	0, 1.06, 0, 0, 0, 0	19 (1.06)
Mackerel joint venture	98	4	Obs. Data	0	1.00	17	17	0	17 (0)
TOTAL									375 190 (.40) (.30)

[1] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. NEFSC collects dealer reported landings data. Total landings are used as a measure of total effort for the coastal gillnet, Northeast sink gillnet and the North Atlantic bottom trawl fisheries.

[2] The observer coverage for the North Atlantic bottom trawl Northeast multispecies sink gillnet fishery are is measured in trips. Observer coverage for the Mid-Atlantic coastal sink gillnet fishery is measured in tons of fish landed. The observer coverage for the North Atlantic and squid, mackerel, butterfish bottom trawl fisheries are measured in trips.

[3] During 1996, 1999, and 2000, and 2001 the observed common dolphins were taken in the *Loligo* squid otter trawl sub-fisheries, and during 1997 the observed common dolphin was taken in the Atlantic mackerel otter trawl sub-fishery.

Table 2. Summary of the incidental mortality of common dolphins (*Delphinus delphis*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels[3]	Data Type [1]	Observer Coverage[2]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
Northeast Multispecies Sink Gillnet	~~96-00~~ 97-01	349	Obs. Data Dealer, Logbooks	~~.04,~~ .06, .05, .06, .06, .04	0, 0, 0, 0, 0	0, 0, 2, 0, 0	0, 0, 0, 0, 0	~~63,~~ 0, 0, 146, 0, 0	~~63,~~ 0, 0, 146, 0, 0	~~1.39~~, 0, 0 .97, 0, 0	~~42,~~ 29 ~~(.78)~~ (.97)
Mid-Atlantic Coastal Gillnet	~~96-00~~ 97-01	NA	Obs. Data Dealer	~~.04,~~ .03, .05, .02, .02, .02	0, 0, 0, 0, 0	~~2,~~ 2, 0, 0, 0, 0	0, 0, 0, 0, 0	~~43,~~ 16, 0, 0, 0, 0	~~43,~~ 16, 0, 0, 0, 0	~~.79,~~ .53, 0, 0, 0, 0	~~12~~ 3 ~~(.59)~~ (.53)
SNE/mid-Atlantic Loligo Squid Trawl (offshore)	97-01	384 [4]	Obs. Data Dealer	.005, .008, .009, .011, .012	0, 0, 0, 0, 0	0, 0, 1, 6, 2	0, 0, 0, 0, 0	0, 0, 49, 273, 126	0, 0, 49, 273, 126	0, 0, .78, .57, 1.09	90 (.47)
SNE/ mid-Atlantic Bottom Trawl	97-01	NA	Obs. Data Dealer	.002, .001, .003, .003, .004	0, 0, 0, 0, 0	1[4], 0, 0, 0, 0	0, 0, 0, 0, 0	93, 0, 0, 0, 0	93, 0, 0, 0, 0	1.06, 0, 0, 0, 0	19 (1.06)
SNE/Mid-Atlantic Mackerel Trawl-domestic	97-01	2,242 [4]	Obs. Data Dealer	.007, .00, .01, .04, .03	0, 0, 0, 0, 0	1, 0, 0, 0, 0	0, 0, 0, 0, 0	161, 0, 0, 0, 0	161, 0, 0, 0, 0	.49, 0 0, 0, 0	32 (.49)
SNE/Mid-Atlantic Mackerel Trawl-JV	1998	4	Obs. Data	1.00	0	17	0	17	17	0	17 (0)
TOTAL											190 (.30)

[1] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. NEFSC collects dealer reported landings data. Total landings are used as a measure of total effort for the coastal gillnet, Northeast sink gillnet and the SNE/Mid-Atlantic and squid, mackerel, butterfish trawl fisheries.

[2] The observer coverage for the Northeast multispecies sink gillnet fishery are measured in trips. Observer coverage for the Mid Atlantic coastal sink gillnet fishery is measured in tons of fish landed. Observer coverage of the SNE/Mid-Atlantic and squid, mackerel, butterfish trawl fisheries are measured in trips.

[3] These are numbers of potential fishing vessels based on permit holders in the 2002 fishery. Many of these vessels participate in the other fisheries and therefore the reported number of vessels are not additive across the squid, mackerel and butterfish fisheries. (67FR 65937).

[4] The incidental take was observed on a trip than landed scup as the primary species.

Other Mortality

From ~~1992-2000~~1997 to 2001, ~~156~~164 common dolphins were reported stranded between ~~North Carolina~~Maine and ~~Massachusetts, predominantly along beaches in the latter state~~Florida (~~NMFS unpublished data~~Table 3). The total includes ~~10 and 9 common dolphins, respectively, that~~ mass stranded ~~in November~~common dolphins in Massachusetts during 1997 ~~and January~~(10 animals); 1998 ~~on Cape Cod~~(9 animals and 5 animals); and 1999 (3 animals), and in North Carolina in 2001 (7animals). Three ~~of 4 live strandings in Massachusetts in 2000 were released~~common dolphins which had stranded alive in Massachusetts in 2000 were released. In 1999, 1 stranding mortality in New Jersey was designated as a human interaction (fishing gear). In 2001, the cause of death of 1 stranding mortality in Virginia and another animal in North Carolina were designated as human interactions/fishing interactions.

Four common dolphin strandings (6 individuals) were reported on Sable Island, Nova Scotia from 1970 to1998, with all ~~strandings~~ having occurred since 1996 (Lucas and Hooker 1997; Lucas and Hooker 2000.)

Table 3. Common dolphin (*Delphinus delphis*) strandings along the US Atlantic coast, 1997-2001

STATE	1997	1998	1999	2000	2001	TOTALS
Maine	0	0	0	0	1	1
Massachusetts[1]	17	21	11	10	8	67
Rhode Island	1[2]	2	5	5	0	13
Connecticut	0	0	0	1	0	1
New York	7	1	6	4	6	24
New Jersey	2	1	3[3]	5	5	16
Delaware	0	0	1	1	1	3
Maryland	0	0	0	3	2	5
Virginia	0	2	2	1	4[3]	9
North Carolina[4]	2	2	0	6	14[3]	24
Georgia	0	0	0	1	0	1
TOTALS	29	29	28	37	41	164

[1] Massachusetts mass strandings (1997 - 10 animals, 1998 - 9 and 5 animals, 1999 - 3 animals)

[2] Boat collision (14 Feb 1997 - Rhode Island)

[3] Fishery/Human Interactions (North Carolina - 1 H.I., fishing gear, April 2001; Virginia - 1 F.I. March 2001, New Jersey - 1 F.I. reported with net marks January 1999)

[4] North Carolina mass stranding (2001 - 7 animals)

STATUS OF STOCK

The status of common dolphins, relative to OSP, in the US Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because ~~the 1996-2000~~the 1997-2001 average annual fishery-related mortality and serious injury ~~exceeds~~does not exceed PBR. The status has changed, but mortality is close to PBR. In the last five editions of this stock assessment report, it has been designated as non-strategic solely in 2002.

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~~January~~December 2002

HARBOR PORPOISE (*Phocoena phocoena)*: Gulf of Maine/Bay of Fundy Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

This stock is found in USA and Canadian Atlantic waters. The distribution of harbor porpoises has been documented by sighting surveys, strandings, and takes reported by NMFS observers in the Sea Sampling Program. During summer (July to September), harbor porpoises are concentrated in the northern Gulf of Maine and southern Bay of Fundy region, generally in waters less than 150 m deep (Gaskin 1977; Kraus *et al.* 1983; Palka 1995a, b), with a few sightings in the upper Bay of Fundy and on the northern edge of Georges Bank (Palka 2000). During fall (October-December) and spring (April-June), harbor porpoises are widely dispersed from New Jersey to Maine, with lower densities farther north and south. They are seen from the coastline to deep waters (> 1800 m; Westgate *et al.* 1998), although the majority of the population is found over the continental shelf. During winter (January to March), intermediate densities of harbor porpoises can be found in waters off New Jersey to North Carolina, and lower densities are found in waters off New York to New Brunswick, Canada. There does not appear to be a temporally coordinated migration or a specific migratory route to and from the Bay of Fundy region. Though, during the fall, several satellite tagged harbor porpoises did favor the waters around the 92 m isobath, which is consistent with observations of high rates of incidental catches in this depth range (Read and Westgate 1997). There were two stranding records from Florida (Smithsonian strandings data base).

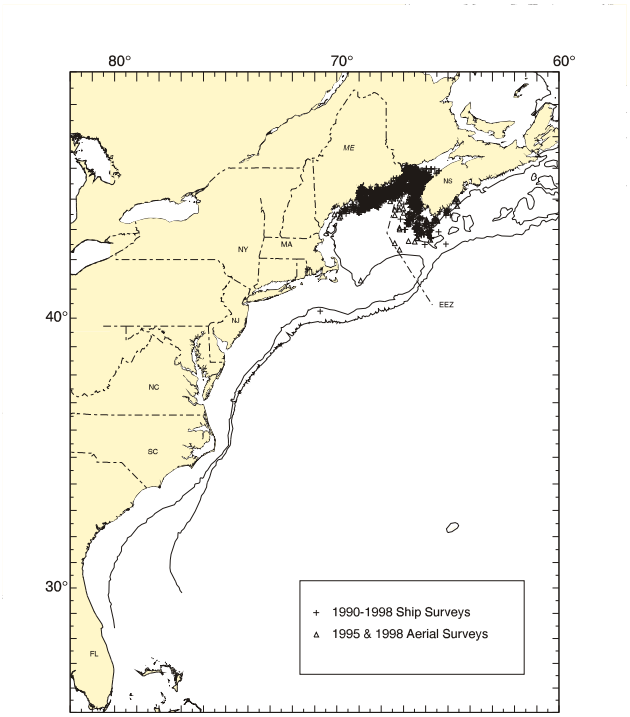

Figure 1. *Distribution of harbor porpoise sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1990-1998. Isobaths are at 100 m and 1,000 m.*

Gaskin (1984, 1992) proposed that there were four separate populations in the western North Atlantic: the Gulf of Maine/Bay of Fundy, Gulf of St. Lawrence, Newfoundland and Greenland populations. Recent analyses involving mtDNA (Wang *et al.* 1996; Rosel *et al.* 1999a, ~~Rosel *et al.*~~ 1999b), organochlorine contaminants (Westgate *et al.*1997; Westgate and Tolley 1999), heavy metals (Johnston 1995), and life-history parameters (Read and Hohn 1995) support Gaskin's proposal. Genetic studies using mitochondrial DNA (Rosel *et al.* 1999a) and contaminant studies using total PCBs (Westgate and Tolley 1999) indicate that the Gulf of Maine/Bay of Fundy females were distinct from females from the other populations in the Northwest~~W~~ Atlantic. Gulf of Maine/Bay of Fundy males were distinct from Newfoundland and Greenland males, but not from Gulf of St. Lawrence males according to studies comparing mtDNA (Rosel *et al.* 1999a; Palka *et al.* 1996) and CHLORs, DDTs, PCBs and CHBs (Westgate and Tolley 1999). Analyses of stranded animals from the mid-Atlantic states suggest that this aggregation of harbor porpoises consists of animals from more than just the Gulf of Maine/Bay of Fundy stock (Rosel *et al.* 1999a). However, the majority of the samples used in the Rosel *et al.* (1999a) study were from stranded juvenile animals. Further work is underway to examine adult animals from this region. Nuclear microsatellite markers have also been applied to samples from these four populations, but this analysis failed to detect significant population sub-division in either sex (Rosel *et al.* 1999a). This pattern may be indicative of female philopatry coupled with dispersal of male ~~harbor porpoises~~. This

report follows Gaskin's hypothesis on harbor porpoise stock structure in the western North Atlantic; Gulf of Maine and Bay of Fundy harbor porpoises are recognized as a single management stock separate from harbor porpoise populations in the Gulf of St. Lawrence, Newfoundland, and Greenland.

POPULATION SIZE

To estimate the population size of harbor porpoises in the Gulf of Maine/Bay of Fundy region, four line-transect sighting surveys were conducted during the summers of 1991, 1992, 1995, and 1999 (Table 1; Figure 1). The estimates ~~population sizes~~ were 37,500 harbor porpoises in 1991 (CV=0.29, 95% confidence interval (CI)=26,700-86,400) (Palka 1995a), 67,500 harbor porpoises in 1992 (CV=0.23, 95% CI=32,900-104,600), 74,000 harbor porpoises in 1995 (CV=0.20, 95% CI=40,900-109,100) (Palka 1996), and 89,700 in 1999 (CV=0.22, 95% CI=53,400 - 150,900) (Palka 2000). The inverse variance weighted-average abundance estimate (Smith *et al.* 1993) of the 1991 to 1995 estimates was 54,300 harbor porpoises (CV=0.14, 95% CI=41,300-71,400). Possible reasons for inter-annual differences in abundance and distribution include experimental error, inter-annual changes in water temperature and availability of primary prey species (Palka 1995b), and movement among population units (e.g., between the Gulf of Maine and Gulf of St. Lawrence). One of the reasons the 1999 estimate is larger than previous estimates is that, for the first time, the upper Bay of Fundy and northern Georges Bank were surveyed and harbor porpoises were seen in both areas ~~during 1999~~. This indicates the harbor porpoise summer habitat is larger than previously thought (Palka 2000).

The shipboard sighting survey procedure used in all four surveys involved two independent teams on one ship that searched using the naked eye in non-closing mode. Abundance, corrected for *g(0)*, the probability of detecting an animal group on the track line, was estimated using the direct-duplicate method (Palka 1995a) and variability was estimated using bootstrap re-sampling methods. Potential biases not explicitly accounted for include ship avoidance and submergence time. The effects of these two potential biases are unknown. During 1995 and 1999 a section of the region was surveyed by airplane while the rest of the region was surveyed by ship, as in previous years (Palka 1996; 2000). During 1995, in addition to the Gulf of Maine/Bay of Fundy area, waters from Virginia to the mouth of the Gulf of St. Lawrence were surveyed and harbor porpoises were seen only in the vicinity of the Gulf of Maine/Bay of Fundy. During 1999, waters from south of Cape Cod to the mouth of the Gulf of St. Lawrence were surveyed (Palka 2000).

The best current abundance estimate of the Gulf of Maine/Bay of Fundy harbor porpoise stock is 89,700 (CV=0.22), based on ~~this is~~ the 1999 survey results not averaged with other years. This is because the 1999 estimate is the most current, and this survey discovered portions of the harbor porpoise range not covered previously.

Kingsley and Reeves (1998) estimated there were 12,100 (CV=0.26) harbor porpoises in the entire Gulf of St. Lawrence during 1995, and 21,700 (CV=0.38) in the northern Gulf of St. Lawrence during 1996. These estimates are presumed to be of the Gulf of St. Lawrence stock of harbor porpoises. The highest densities were north of Anticosti Island, with lower densities in the central and southern Gulf. During the 1995 survey, 8,427 km of track lines were flown in an area of 221,949 km^2 during August and September. During the 1996 survey, 3,993 km of track lines were flown in an area of 94,665 km^2 during July and August. Data were analyzed using Quenouille's jackknife bias reduction procedure on line transect methods that modeled the left truncated sighting curve. These estimates were not corrected for visibility biases such as *g(0)*.

Table 1. Summary of abundance estimates for the Gulf of Maine/Bay of Fundy harbor porpoise for the entire area that was surveyed and a common area that was surveyed in all years. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	Entire survey area		Common survey area
		N_{best}	CV	N
Jul-Aug 1991	N. Gulf of Maine & lower Bay of Fundy	37,500	0.29	29,000
Jul-Sep 1992	N. Gulf of Maine & lower Bay of Fundy	67,500	0.23	57,600
Jul-Sep 1995	N. Gulf of Maine & lower Bay of Fundy	74,000	0.20	71,900
Inverse variance-weighted average of above 1991, 1992 and 1995 estimates		54,300	0.14	-
Jul-Aug 1999	S. Gulf of Maine to upper Bay of Fundy	89,700	0.22	67,600

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for harbor porpoises is 89,700 (CV=0.22). The minimum population estimate for the Gulf of Maine/Bay of Fundy harbor porpoise is 74,695 (CV=0.22).

Current Population Trend

Analyses are underway to determine if trend information can be obtained from the four NEFSC surveys. Previous abundance estimates for harbor porpoises in the Gulf of Maine/Bay of Fundy are available from earlier studies, (e.g., 4,000 animals (Gaskin 1977), and 15,800 animals (Kraus *et al.* 1983)). These estimates cannot be used in a trends analysis because they were for selected small regions within the entire known summer range and, in some cases, did not incorporate an estimate of *g(0)* (NEFSC 1992).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Although current population growth rates of Gulf of Maine/Bay of Fundy harbor porpoises have not been estimated due to lack of data, several attempts have been made to estimate potential population growth rates. Barlow and Boveng (1991), who used a re-scaled human life table, estimated the upper bound of the annual potential growth rate to be 9.4%. Woodley and Read (1991) used a re-scaled Himalayan tahr life table to estimate a likely annual growth rate of 4%. In an attempt to estimate a potential population growth rate that incorporates many of the uncertainties in survivorship and reproduction, Caswell *et al.* (1998) used a Monte Carlo method to calculate a probability distribution of growth rates. The median potential annual rate of increase was approximately 10%, with a 90% confidence interval of 3-15%. This analysis underscored the considerable uncertainty that exists regarding the potential rate of increase in this population. Consequently, for the purposes of this assessment, the maximum net productivity rate was assumed to be 4%, consistent with values used for other cetaceans for which direct observations of maximum rate of increase are not available, and following a recommendation from the Atlantic Scientific Review Group. The 4% value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum

population size is 74,695 (CV=0.22). The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the Gulf of Maine/Bay of Fundy harbor porpoise is 747.

ANNUAL HUMAN-CAUSED MORTALITY

Data to estimate the mortality and serious injury of harbor porpoise come from USA and Canadian Sea Sampling Programs ~~and~~, from records of strandings in USA waters, and from records in the Marine Mammal Authorization Program (MMAP). Estimates using Sea Sampling Program and MMAP data are discussed by fishery under the Fishery Information section (Table 2). Strandings records are discussed under the Unknown Fishery in the Fishery Information section (Table 3) and under the Other Mortality section (Tables 4 to 5).

A take reduction plan was implemented 01 January 1999 to reduce takes of harbor porpoises in USA Atlantic gillnet fisheries. In addition, several New England and mid-Atlantic Fishery Management Council plans that apply to parts of the gillnet fisheries were also implemented during 1999. Because these plans changed the USA gillnet fisheries, only 1999 ~~and~~to 200~~0~~1 USA mortality estimates are representative of the current USA mortality.

The total annual estimated average human-caused mortality is ~~459~~365 (CV=0.2~~4~~3) harbor porpoises per year. This is derived from four components: ~~425~~310 harbor porpoise per year (CV=0.2~~4~~3) from USA fisheries using observer and MMAP data, ~~23~~46 per year (unknown CV) from Canadian fisheries using observer data, ~~1~~0~~8~~ per year from USA unknown fisheries using strandings data, and 1 per year from unknown human-caused mortality (a mutilated stranded harbor porpoise).

Fishery Information

Recently, Gulf of Maine/Bay of Fundy harbor porpoise takes have been documented in the USA Northeast sink gillnet, mid-Atlantic coastal gillnet, and in the Canadian Bay of Fundy groundfish sink gillnet and herring weir fisheries (Table 2).

EARLIER INTERACTIONS

Pelagic Drift Gillnet

In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997. The fishery operated during 1998. Then, in January 1999 NMFS issued a Final Rule to prohibit the use of drift net gear in the North Atlantic swordfish fishery (50 CFR Part 630). One harbor porpoise was observed taken from the Atlantic pelagic drift gillnet fishery during 1991-1998. The estimated total number of hauls in the Atlantic pelagic drift gillnet fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. In 1994 to 1998 there were 11, 12, 10, 0, and 11 vessels, respectively, in the fishery. The estimated number of hauls in 1991, 1992, 1993, 1994, 1995 and 1996 were 233, 243, 232, 197, 164, and 149 respectively. Observer coverage, expressed as percent of sets observed was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994, 99% in 1995, 64% in 1996, and 99% in 1998. The decline in observer coverage in 1996 is attributable to trips made by vessels that were deemed unsafe for observers due to the size or condition of the fishing vessel. Fishing effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras. Examination of the species composition of the catch and locations of the fishery throughout the year suggested that the drift gillnet fishery be stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of the total bycatch, for each year from 1989 to 1993, were obtained using the aggregated (pooled 1989-1993) catch rates, by stratum~~a~~ (Northridge 1996). Estimates of total annual bycatch after 1993 were estimated from the sum of the observed caught and the product of the average bycatch per haul and the number of unobserved hauls as recorded in logbooks. Variances were estimated using bootstrap re-sampling techniques (Bisack 1997b). The one observed bycatch was notable because it occurred in continental shelf edge waters adjacent to Cape Hatteras (Read *et al.* 1996). Estimated annual fishery-related mortality (CV in parentheses) attributable to this fishery was 0.7 in 1989 (7.00), 1.7 in 1990 (2.65), 0.7 in 1991 (1.00), 0.4 in 1992 (1.00), 1.5 in 1993 (0.34), 0 in 1994 to 1996, and 0 in 1998. The fishery was closed during 1997. Average estimated harbor porpoise mortality and serious injury in the Atlantic pelagic drift gillnet fishery during 1994-1998 was 0.0.

USA

Recent data on incidental takes in USA fisheries are available from several sources. The only source that documented harbor porpoise bycatch is the Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program that was initiated in 1990, and since that year, several fisheries have been covered by the program.

Northeast Sink Gillnet

Before 1998 most of the documented harbor porpoise takes from USA fisheries were from the Northeast sink gillnet fishery. In 1984 the Northeast sink gillnet fishery was investigated by a sampling program that collected information concerning marine mammal bycatch. Approximately 10% of the vessels fishing in Maine, New Hampshire, and Massachusetts were sampled. Among the eleven gillnetters who received permits and logbooks, 30 harbor porpoises were reported caught. It was estimated, using rough estimates of fishing effort, that a maximum of 600 harbor porpoises were killed annually in this fishery (Gilbert and Wynne 1985, 1987).

In 1990, an observer program was started by NMFS to investigate marine mammal takes in the Northeast sink gillnet fishery. There have been 45~~2~~4 harbor porpoise mortalities related to this fishery observed between 1990 and 200~~0~~1 and one was released alive and uninjured. In 1993, there were approximately 349 full- and part-time vessels in the Northeast sink gillnet fishery (Table 2). An additional 187 vessels were reported to occasionally fish in the Gulf of Maine with gillnets for bait or personal use; however, these vessels were not covered by the observer program (Walden 1996) and their fishing effort was not used in estimating mortality. During 1998, an estimated 301 full- and part-time vessels participated in this fishery. This is the number of unique vessels in the commercial landings database (Weighout) that reported catch from this fishery during 1998 from the states of Rhode Island to Maine. This does not include a small percentage of records where the vessel number was missing. Observer coverage in terms of trips was 1%, 6%, 7%, 5%, 7%, 5%, 4%, 6%, 5%, 6%, 6% and ~~6%~~4% for 1990 to 200~~0~~1, respectively. Bycatch in the northern Gulf of Maine occurs primarily from June to September, while in the southern Gulf of Maine, bycatch occurs from January to May and September to December. Annual estimates of harbor porpoise bycatch in the Northeast sink gillnet fishery reflect seasonal distribution of the species and of fishing effort. Bycatch estimates included a correction factor for the under-recorded number of by-caught animals that occurred during unobserved hauls on trips with observers on the boat, when applicable. Need for such a correction became evident following re-analysis of data from the sea sampling program indicating that for some years bycatch rates from unobserved hauls were lower than that for observed hauls. Further analytical details are given in Palka (1994), CUD (1994), and Bravington and Bisack (1996). These revised bycatch estimates replace those published earlier (Smith *et al.* 1993). Estimates presented here are still negatively biased because they do not include harbor porpoises that fell out of the net while still underwater. This bias cannot be quantified at this time. Estimated annual bycatch (CV in parentheses) from this fishery during 1990-200~~0~~1 was 2,900 in 1990 (0.32), 2,000 in 1991 (0.35), 1,200 in 1992 (0.21), 1,400 in 1993 (0.18) (Bravington and Bisack 1996; CUD 1994), 2100 in 1994 (0.18), 1400 in 1995 (0.27) (Bisack 1997a), 1200 in 1996 (0.25), 782 in 1997 (0.22), 332 in 1998 (0.46), 270 in 1999 (0.28) (Rossman and Merrick 1999), ~~and~~ 507 in 2000 (0.37), and 51 (0.97) in 2001. The increase in the 1998 and 2001 CV is mainly due to the small number of observed takes.

In November 2001, there were two takes reported through the Marine Mammal Authorization Program (MMAP) that were taken in one sink gillnet haul located near Jeffery's Ledge. These two takes were then added to the 2 observed takes and 51 estimated total take that was derived from the observer data because the MMAP takes were in a time and area not included in any of the above observer-based bycatch estimates. This then results in 4 observed takes and 53 (0.97) total takes in 2001 from this fishery (Table 2).

There appeared to be no evidence of differential mortality in USA or Canadian gillnet fisheries by age or sex in animals collected before 1994, although there was substantial inter-annual variation in the age and sex composition of the bycatch (Read and Hohn 1995). Using observer data collected during 1990 to 1998 and a logit regression model, females were 11 times more likely to be caught in the offshore southern Gulf of Maine region, males were more likely to be caught in the south Cape Cod region, and the overall proportion of males and females caught in a gillnet and brought back to land were not significantly different from 1:1 (Lamb 2000).

Two preliminary experiments, using acoustic alarms (pingers) attached to gillnets, were conducted in the Gulf of Maine during 1992 and 1993 and took 10 and 33 harbor porpoises, respectively. During fall 1994, a controlled scientific experiment was conducted in the southern Gulf of Maine, where all nets with and without active pingers were observed (Kraus *et al.* 1997). In this experiment 25 harbor porpoises were taken in 423 strings with non-active pingers (controls) and 2 harbor porpoises were taken in 421 strings with active pingers. In

addition, 17 other harbor porpoises were taken in nets that did not follow the experimental protocol (Table 2). From 1995 to 1997, experimental fisheries were conducted where all nets in a designated area were required to use pingers and only a sample of the nets were observed. During November-December 1995, an experimental fishery was conducted in the southern Gulf of Maine (Jeffreys Ledge) region, where no harbor porpoises were observed taken in 225 pingered nets. During 1995, all takes from pingered nets were added directly to the estimated total bycatch for that year. During April 1996, 3 other experimental fisheries occurred. In the Jeffreys Ledge area, in 88 observed hauls using pingered nets, 9 harbor porpoises were taken. In the Massachusetts Bay region, in 171 observed hauls using pingered nets, 2 harbor porpoises were taken. And, in a region just south of Cape Cod, in 53 observed hauls using pingered nets, no harbor porpoises were taken. During 1997, experimental fisheries were allowed in the mid-coast region during March 25 to April 25 and November 1 to December 31. During the 1997 spring experimental fishery, 180 hauls were observed with active pingers and 220 hauls were controls (silent). All observed harbor porpoise takes were in silent nets: 8 in nets with control (silent) pingers, and 3 in nets without pingers. Thus, there was a statistical difference between the catch rate in nets with pingers and silent nets (Kraus and Brault, 1997 ~~in press~~). During the 1997 fall experimental fishery, out of 125 observed hauls using pingered nets no harbor porpoises were taken.

From 95 stomachs of harbor porpoises collected in groundfish gillnets in the Gulf of Maine between September and December 1989-94, Atlantic herring (*Clupea harengus*) was the most important prey. Pearlsides (*Maurolicus weitzmani*), silver hake (*Merluccius bilinearis*) and red and white hake (*Urophycis* spp.) were the next most common prey species (Gannon *et al.* 1998).

Average estimated harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery during 1994-1998 before the Take Reduction Plan was 1,163 (0.11). Because of the Take Reduction Plan to reduce takes in USA Atlantic gillnets, and the NEFMC fishery management plans to manage groundfish, fishing practices changed during 1999. Subsequently, the average annual harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery from 1999 to 200~~0~~1 was ~~only 388~~277 (0.2~~6~~5).

Mid-Atlantic Coastal Gillnet

Before an observer program was in place, Polacheck *et al.* (1995) reported one harbor porpoise incidentally taken in shad nets in the York River, Virginia. In July 1993 an observer program was initiated in the mid-Atlantic coastal gillnet fishery by the NEFSC Sea Sampling program. This fishery, which extends from North Carolina to New York, is actually a combination of small vessel fisheries that target a variety of fish species.~~,~~ ~~s~~Some of the vessels operate right off the beach, some using drift nets and others using sink nets. During 1998, it was estimated that there were 302 full and part-time sink gillnet vessels and an undetermined number of drift gillnet vessels participating in this fishery. This is the number of unique vessels in the commercial landings database (Weighout) that reported catch from this fishery during 1998 from the states of Connecticut to North Carolina. This does not include a small percentage of records where the vessel number was missing. Twenty trips were observed during 1993. During 1994 and 1995, 221 and 382 trips were observed, respectively. Observer coverage, expressed as percent of tons of fish landed, was 5% for 1995, 4% for 1996, 3% for 1997, 5% for 1998, 2% for 1999, 2% for 2000 and 2% for 200~~0~~1 (Table 2). No harbor porpoises were taken in observed trips during 1993 and 1994. During 1995 to 200~~0~~1, respectively, 6, 19, 32, 53, 3, 1 and 1 harbor porpoises were observed taken (Table 2). Observed fishing effort has been scattered between New York and North Carolina from the beach to 50 miles off the beach. Documented bycatches after 1995 were from December to May. Bycatch estimates were calculated using methods similar to that used for bycatch estimates in the Northeast gillnet fishery (Bravington and Bisack 1996; Bisack 1997a). After 1998, a separate bycatch estimate was made for the drift gillnet and set gillnet sub-fisheries. The number presented here is the sum of these two sub-fisheries. The estimated annual mortality (CV in parentheses) attributed to this fishery was 103 (0.57) for 1995, 311 (0.31) for 1996, 572 (0.35) for 1997, 446 (0.36) for 1998, 53 (0.49) for 1999, ~~and~~ 21 (0.76) for 2000 and 26 (0.95) for 2001. Annual average estimated harbor porpoise mortality and serious injury from the mid-Atlantic coastal gillnet fishery before the Take Reduction Plan (during 1995 to 1998) was 358 (CV=0.20) (Table 2). Because of the Take Reduction Plan to reduce takes in USA Atlantic gillnets, and the fishery management plans to manage groundfish, fishing practices changed during 1999. Subsequently, the average annual harbor porpoise mortality and serious injury in the mid-Atlantic coastal gillnet fishery from 1999 and 200~~0~~1 was ~~only 37~~3 (0.~~41~~39).

Unknown Fishery

The strandings and entanglement database, maintained by the New England Aquarium and the Northeast Regional Office/NMFS, reported 228, 27 and ~~26~~113 stranded harbor porpoises during 1999 ~~and~~to 200~~0~~1, respectively (see Other Mortality section for more details). Of these, it was determined that the cause of death of 19, 1 and ~~1~~3 stranded harbor porpoises in 1999 ~~and~~to 200~~0~~1, respectively, were due to gillnets (Tables 3 and 5), and these animals were in areas and times that were not included in the above mortality estimate derived from observer program data ~~(Table 3)~~. The ~~current~~ average harbor porpoise mortality and serious injury in this unknown fishery category from 1999 ~~and~~to 200~~0~~1 is ~~10~~8 (CV is unknown).

North Atlantic Bottom Trawl

~~One~~Two harbor porpoise ~~mortality was~~mortalities were observed in the North Atlantic bottom trawl fishery between 1989 and 200~~0~~1. Vessels in this fishery, a Category III fishery under the MMPA, were observed in order to meet fishery management needs rather than marine mammal management needs. An average of 970 (CV=0.04) vessels (full- and part-time) participated annually in the fishery during 1989-1993. This fishery is active in New England waters in all seasons.

The ~~one~~first take occurred in February 1992 east of Barnegat~~t~~ Inlet, New Jersey~~York~~ at the continental shelfbreak. The animal was clearly dead prior to being taken by the trawl, because it was severely decomposed and the tow duration of 3.3 hours was insufficient to allow extensive decomposition~~; therefore~~.

The second take occurred in January 2001 off New Hampshire in a haul trawling for flounder. This animal was clearly dead prior to being taken by the trawl, because it was severely decomposed (the skull broke off while the net was emptying) and the tow duration was 3.1 hours. This take was observed in the same time and area stratum that had documented gillnet takes.

In conclusion, the estimated bycatch ~~for~~of harbor porpoises due to this fishery is 0.

CANADA

Hooker *et al.* (1997) summarized bycatch data from a Canadian fisheries observer program that placed observers on all foreign fishing vessels operating in Canadian waters, on ~~between~~ 25-40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. No harbor porpoises were observed taken.

Bay of Fundy Sink Gillnet

During the early 1980's, Canadian harbor porpoise bycatch in the Bay of Fundy sink gillnet fishery, based on casual observations and discussions with fishermen, was thought to be low. The estimated harbor porpoise bycatch in 1986 was 94-116 and in 1989 it was 130 (Trippel *et al.* 1996). The Canadian gillnet fishery occurs mostly in the western portion of the Bay of Fundy during the summer and early autumn months, when the density of harbor porpoises is highest. Polacheck (1989) reported there were 19 gillnetters active in 1986, 28 active in 1987, and 21 in 1988.

More recently, an observer program implemented in the summer of 1993 provided a total bycatch estimate of 424 harbor porpoises (± 1 SE: 200-648) from 62 observed trips, (approximately 11.3% coverage of the Bay of Fundy trips) (Trippel *et al.* 1996).

During 1994, the observer program was expanded to cover 49% of the gillnet trips (171 observed trips). The bycatch was estimated to be 101 harbor porpoises (95% confidence limit: 80-122), and the fishing fleet consisted of 28 vessels (Trippel *et al.* 1996).

During 1995, due to groundfish quotas being exceeded, the gillnet fishery was closed from July 21 to August 31~~, 1995~~. During the open fishing period of 1995, 89% of the trips were observed, all in the Swallowtail region. Approximately 30% of these observed trips used pingered nets. The estimated bycatch was 87 harbor porpoises (Trippel *et al.* 1996). No confidence interval was computed due to lack of coverage in the Wolves fishing grounds.

During 1996, the Canadian gillnet fishery was closed during July 20-31 and August 16-31 due to groundfish quotas. From the 107 monitored trips, the bycatch in 1996 was estimated to be 20 harbor porpoises (Trippel *et al.* 1999; DFO 1998). Trippel *et al.* (1999) estimated that during 1996, gillnets equipped with acoustic alarms reduced harbor porpoise bycatch rates by 68% over nets without alarms in the Swallowtail area of the lower Bay of Fundy.

During 1997, the fishery was closed to the majority of the gillnet fleet during July 18-31 and August 16-31, due to groundfish quotas. In addition a time-area closure to reduce porpoise bycatch in the Swallowtail area

occurred during September 1-7~~, 1997~~. From the 75 monitored trips during 1997, 19 harbor porpoises were observed taken. After accounting for total fishing effort, the estimated bycatch in 1997 was 43 animals (DFO 1998). Trippel *et al.* (1999) estimated that during 1997, gillnets equipped with acoustic alarms reduced harbor porpoise bycatch rates by 85% over nets without alarms in the Swallowtail area of the lower Bay of Fundy.

During 1998, the number of fishing vessels was appreciably lower than in previous years due to very poor groundfish catch rates, even though the fishery was open July to September. The observer program monitored 111 trips and observed 5 harbor porpoise mortalities. ~~Seventeen trips were monitored and 1 harbor porpoise mortality was observed. Fishers independently reported an additional 4 porpoises. The Wolves and Head Harbour area had 7 fishing trips in July and did not receive observer coverage. A preliminary total bycatch for Bay of Fundy in 1998 was estimated at 10 porpoises.~~ Preliminary analyses indicate that the total mortality estimate is 38 harbor porpoises (Trippel and Shepard, in review). Estimates of variance are not available (~~DFO 1998~~).

During 1999, observer coverage was from July to early September. The observer program monitored 93 trips and observed 3 harbor porpoise mortalities. ~~Three fishing vessels were observed, one each near the Wolves, Digby Neck, and McDorm and Patch, for a total of 179 observed hauls. Three harbor porpoise takes were observed.~~ Preliminary analyses indicate the total mortality estimate is 32~~not likely to exceed 20~~ harbor porpoises (Trippel and Shepard, in review~~, pers. comm.). Acoustic reflective nets were also tested during this fishing season.~~

During 2000, 194 trips were monitored and 5 harbor porpoise mortalities were observed. ~~there was an observer program.~~ Preliminary analyses indicate that the total mortality estimate is 28 harbor porpoises~~approximately 10~~ (Trippel and Shepard, in review~~, pers. comm.~~). ~~More detailed information will be available later.~~

During 2001, 285 trips were monitored and 39 harbor porpoise mortalities were observed. Preliminary analyses indicate that the total mortality is 73 harbor porpoises (Trippel and Shepard, in review).

There was no observer program during the summer of 2002 in the Bay of Fundy region.

Average estimated harbor porpoise mortality in the Canadian groundfish sink gillnet fishery during ~~1996-2000~~1997-2001 was 2~~3~~42 (Table 2). An estimate of variance is not possible.

Herring Weirs

Harbor porpoises are taken frequently in Canadian herring weirs, but there have been no recent efforts to observe takes in the USA component of this fishery. Weirs operate from May to ~~September~~October ~~each year~~ along the southwestern shore of the Bay of Fundy, and the coasts of western Nova Scotia and northern Maine. In 1990, there were 180 active weirs in the western Bay of Fundy and 56 active weirs in Maine (Read 1994). According to state officials, in 1998, the number of weirs in Maine waters dropped to nearly zero due to the limited herring market (Jean Chenoweth, pers. comm.), and in 2000, only 11 weirs were built (Molyneaux 2000). According to Canadian officials, for 1998, there were 225 licenses for herring weirs on the New Brunswick side and 30 from the Nova Scotia side of the Bay of Fundy (in New Brunswick: 60 from Grand Manan Island, 95 from Deer and Campobello Islands, 30 from Passamaquoddy Bay, 35 from East Charlotte area, and 5 from the Saint John area). The number of licenses has been fairly consistent since 1985 (Ed Trippel, pers. comm.), but the number of active weirs is less than the number of licenses, and has been decreasing every year, primarily due to competition with salmon mariculture sites (A. Read, pers. comm.). In 2001, there were 25 active weirs around Grand Manan (H. Koopman pers. comm), numbers for the Nova Scotia shore, Campobello, Deer and the Wolves Islands, or the New Brunswick mainland shore are unknown. In 2002 there were 21 active weirs around Grand Manan (H. Koopman pers. comm).

Smith *et al.* (1983) estimated that, in the 1980's, approximately 70 harbor porpoises became trapped annually and, on average, 27 died annually. In 1990, at least 43 harbor porpoises were trapped in Bay of Fundy weirs (Read 1994). In 1993, after a cooperative program between fishermen and Canadian biologists was initiated, over 100 harbor porpoises were released alive (Read 1994). Between 1992 and 1994, this cooperative program resulted in the live release of 206 of 263 harbor porpoises caught in herring weirs. Mortalities (and releases) were 11 (and 50) in 1992, 33 (and 113) in 1993, and 13 (and 43) in 1994 (Neimanis *et al.* 1995). Since that time, an additional 488 harbor porpoises have been documented in Canadian herring weirs, of which 460 were released or escaped and 28 died. Mortalities (and releases) were 5 (and 60) in 1995; 2 (and 4) in 1996; 2 (and 24) in 1997; 2 (and 26) in 1998; 3 (and 89) in 1999; 0 (and 13) in 2000 (A. Read, pers. comm), and 14 (and 244) in 2001 (~~A. Read, pers. comm.~~H. Koopman, pers. comm.). In addition, it is known that in 2001, an additional fifty-two animals swam out of weirs on their own (H. Koopman, pers. comm).

Clinical hematology values were obtained from 29 harbor porpoises released from Bay of Fundy herring weirs (Koopman *et al.* 1999). These data represent a baseline for free-ranging harbor porpoises that can be used as a reference for long-term monitoring of the health of this population, a mandate by the MMPA. Blood for both hematology and serum chemistry, including stress and reproductive hormones, is currently being collected; with 57 samples from 2001 and 13 from 2002 (H. Koopman, pers. comm).

Average estimated harbor porpoise mortality in the Canadian herring weir fishery during ~~1996-2000~~ 1997-2001 was ~~1~~4.8~~2~~ (Table 2). An estimate of variance is not possible.

Table 2. From observer program data, summary of the incidental mortality of harbor porpoise (*Phocoena phocoena*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [1]	Observer Coverage [2]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
USA								
Northeast Sink Gillnet	Before TRP[6] 94-98	1993=349 1998=301	Obs. Data Weighout, Trip Logbook	.07, .05, .04, .06, .05	99[3], 43[3], 52[3], 47[3], 12[3]	2100[3], 1400[3], 1200[3], 782[3], 332[3]	.18, .27, .25, .22, .46	1163 (0.11)
	After TRP[6] 99-00~~0~~1	NA	Obs. Data, Weighout, Trip Logbook	.06, .06, .04	14[3],15[3], 4[3,8]	270[3], 507[3], 53[3,8]	.28, .37, .97	~~388~~277 (0.2~~6~~5)
mid-Atlantic Coastal Gillnet	Before TRP[6] 95-98[4]	1998=302~~*~~[7]	Obs. Data Weighout	.05, .04, .03, .05,	6, 19, 32, 53	103, 311, 572, 446	.57, .31, .35, .36	358 (0.20)
	After TRP[6] 99-00~~0~~1	NA	Obs. Data Weighout	.02, .02, .02	3, 1, 1	53, 21, 26	.49, .76, .95	3~~7~~3 (0.~~41~~39)
USA TOTAL	1999-200~~0~~1 only							~~425~~310 (0.2~~4~~3)
CANADA								
Groundfish Sink Gillnet	~~96-00~~97-01	~~NA (1994=28)~~ NA, 22, 11, 13, 13	Obs. Data Can. Trips	~~.8,~~ .8, .4~~8~~, .36~~NA~~[2], .77~~NA~~[9], NA	~~13,~~ 19, 5~~1~~, ~~3~~3, ~~NA~~[9], 5, 39	~~20,~~ 43, 38~~10~~, 32~~20~~[7], 28~~10~~[9], 73	NA	~~21~~42 (NA)
Herring Weir	~~96-00~~97-01	1998=255 licenses[5]	Coop. Data	NA	2, 2, ~~2,~~ 3, 0, 14	2, 2, ~~2,~~ 3, 0, 14	NA	~~1~~4.~~8~~2 (NA)
CANADIAN TOTAL	1997~~6~~ - 200~~0~~1							~~23~~46 (NA)
GRAND TOTAL								~~448~~346 (NA)

NA = Not available.

[1] Observer data (Obs. Data) are used to measure bycatch rates; the USA data are collected by the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program, the Canadian data are collected by DFO. NEFSC collects Weighout (Weighout) landings data, that are used as a measure of total effort for the USA gillnet fisheries. The Canadian DFO catch and effort statistical system collected the total number of trips fished by the Canadians (Can. trips), which was the measure of total effort for the Canadian groundfish gillnet fishery. Mandatory trip logbook (VTR) (Trip Logbook) data are used to determine the spatial distribution of fishing effort in the Northeast sink gillnet fishery. Observed mortalities from herring weirs are collected by a cooperative program between fishermen and Canadian biologists (Coop. Data).

[2] The observer coverage for the USA and Canadian sink gillnet fishery is measured in trips, and for the mid-Atlantic coastal gillnet fishery, the unit of effort is tons of fish landed.

[3] Harbor porpoise taken before 1997 in observed pinger trips were added directly to the estimated total bycatch for that year. During 1997, harbor porpoises were taken on non-pingered scientific experimental

strings within a time/area stratum that required pingers; during 1998, harbor porpoises were taken on a pingered string within a stratum that did not require pingers; during 2000, a harbor porpoise was taken on a non-pingered string within a stratum that did not require pingers but that stratum ~~also~~ had other trips where strings with pingers were observed; and during 1999-200~~0~~1, harbor porpoises were taken on pingered strings within strata that required pingers but that stratum also had observed strings without pingers. For estimates made during 1998 and after, a weighted bycatch rate was applied to effort from both pingered and non-pingered hauls within ~~the above~~a stratum. The weighted bycatch rate was:

$$\sum_{i}^{\rho hng,\, non-\rho hng} \frac{\#porpoise_i}{sslandings_i} \cdot \frac{\#hauls_i}{total\#hauls}$$

There were 10, 33, 44, 0, 11, 0, 2, 8, 6, and ~~6~~2 observed harbor porpoise takes on pinger trips from 1992 to 200~~0~~1, respectively, that are included in the observed mortality column. In addition, there were 9, 0, 2, 1,1, 4, and ~~4~~0 observed harbor porpoise takes in 1995 to 200~~0~~1, respectively, on trips dedicated to fish sampling versus dedicated to watching for marine mammals; these are included in the observed mortality column (Bisack 1997a).

[4] Only data after 1994 are reported because the observed coverages during 1993 and 1994 were negligible during the times of the year when harbor porpoise takes were possible.

[5] There were 255 licenses for herring weirs in the Canadian Bay of Fundy region.

[6] Effective 01 January 1999, a take reduction plan (TRP) was put into place to reduce bycatch of harbor porpoises in gillnets. See the section "USA Management Measures Taken to Reduce Bycatch" for more details.

[7] ~~1999 Canadian gillnet bycatch estimates are not completed. In total, 179 strings (60 trips) were observed. Preliminary analyses indicate bycatch is likely not to exceed 20 animals. (Trippel, pers. comm.)~~

[7][8] Sink gillnet vessels only. Number of drift gillnet vessels presently undetermined.

[9] ~~2000 Canadian gillnet bycatch estimate are not completed. Preliminary analyses indicate bycatch will not exceed 10 animals (Trippel, pers. comm).~~

[8] During 2001 in the US Northeast sink gillnet fishery, there were 2 takes observed in the NEFSC observer program, this resulted in an estimate of 51 total bycaught harbor porpoises. In November 2001, there were two takes reported through the Marine Mammal Authorization Program that were from one sink gillnet haul that was located near Jeffery's Ledge. These two takes were then added to the 2 observed takes and 51 estimated total take derived from the observer data, resulting in 4 observed takes and 53 total takes for the fishery during 2001.

Table 3. From strandings and entanglement data, summary of confirmed incidental mortality of harbor porpoises (*Phocoena phocoena*) by fishery: includes years sampled (Years), number of vessels active within the fishery (Vessels), type of data used (Data Type), mortalities assigned to this fishery (Assigned Mortality), and mean annual mortality.

Fishery	Years	Vessels	Data Type [1]	Assigned Mortality	Mean Annual Mortality
Unknown gillnet fishery	99-0~~0~~1	NA	Entanglement & Strandings	19, 1, 3	~~10~~8
TOTAL					~~10~~8

NA=Not Available.

[1] Data from records in the entanglement and strandings data base maintained by the New England Aquarium and the Northeast Regional Office/NMFS (Entanglement and Strandings).

Other Mortality
USA

There is evidence that harbor porpoises were harvested by natives in Maine and Canada before the 1960's, and the meat was used for human consumption, oil, and fish bait (NEFSC 1992). The extent of these past harvests is unknown, though it is believed to have been small. Up until the early 1980's, small kills by native hunters (Passamaquoddy Indians) were reported. In recent years it was believed to have nearly stopped (Polacheck 1989) until ~~recent public~~ media reports in September 1997 depicted a Passamaquoddy tribe member dressing out a harbor porpoise. Further articles describing use of porpoise products for food and other purposes were timed to coincide with ongoing legal action in state court.

During 1993, 73 harbor porpoises were reported stranded on beaches from Maine to North Carolina (~~Table 4,~~ Smithsonian Marine Mammal Database). Sixty-three of those harbor porpoises were reported stranded in the USA mid-Atlantic region from New York to North Carolina between February and May. Many of the mid-Atlantic carcasses recovered in this area during this time period had cuts and body damage suggestive of net marking (Haley and Read 1993). Five out of 8 carcasses and 15 heads from the strandings that were examined showed signs of human interactions (net markings on skin and missing flippers or flukes). Decomposition of the remaining animals prevented determination of the cause of death. Earlier reports of harbor porpoise entangled in gillnets in Chesapeake Bay and along the New Jersey coast and reports of apparent mutilation of harbor porpoise carcasses raised concern that the 1993 strandings were related to a coastal net fishery, such as the American shad coastal gillnet fishery (Haley and Read 1993). Between 1994 and 1996, 107 harbor porpoise carcasses were recovered from beaches in Maryland, Virginia, and North Carolina and investigated by scientists. Only juvenile harbor porpoises were present in this sample. Of the 40 harbor porpoises for which cause of death could be established, 25 displayed definitive evidence of entanglement in fishing gear. In 4 cases it was possible to determine that the animal was entangled in monofilament nets (Cox *et al.* 1998).

Records of harbor porpoise strandings prior to 1997 are stored in the Smithsonian's Marine Mammal Database and records from 1997 to present are stored in the NE Regional Office/NMFS strandings and entanglement database. According to these records, the numbers of harbor porpoises that stranded on beaches from North Carolina to Maine during 1994 to 200~~0~~1 were 106, 86, 94, 118, 59, 228, 27 and ~~26,~~113 respectively (Table 4). Of these, 3 stranded alive on a Massachusetts beach in 1996, were tagged, and subsequently released. In 1998, 2 porpoises that stranded on a New Jersey beach had tags on them indicating they were originally taken on an observed mid-Atlantic coastal gillnet vessel. During 1999, 6 animals stranded alive and were either tagged and released or brought to Mystic Aquarium for rehabilitation (Table 4).

During 1999, over half of the strandings occurred on beaches of Massachusetts and North Carolina. The states with the next largest numbers were Virginia, New Jersey, and Maryland, in that order. The cause of death was investigated for all the 1999 strandings (Table 5). Of these, it was possible to determine that the cause of death of 3~~6~~8 animals was fishery interactions. Of these 3~~6~~8, 19 animals were in an area and time that were not part of a bycatch estimate derived using observer data. Thus, these 19 mortalities are attributed to an unknown gillnet fishery (Table 3). One additional animal was found mutilated (right flipper and fluke was cut off)~~. This animal~~ and cause of death was attributed to an unknown human-caused mortality (Table 5).

During 2000, only 2~~6~~7 harbor porpoises stranded on beaches from Maine to North Carolina (Table 4). Of these, most came from Massachusetts (8) or North Carolina (6). The cause of death for 1 animal was in an area and time that was not part of a bycatch estimate derived from observer data, and thus was attributed to an unknown gillnet fishery (Tables 3 and 5). This animal was found on a beach in Virginia during May with mono-filament line wrapped around it. In addition, 1 animal was found mutilated and so cause of death was attributed to an unknown human-caused mortality (Table 5).

During 2001, 113 harbor porpoises were reported stranded, of these most came from Massachusetts (39), Virginia (28), and North Carolina (21). Thirteen of these stranding displayed signs of fishery interactions, of these 3 animals were in an area and time that were not part of a bycatch estimate derived from the observer data (Tables 3 and 5).

Averaging 1999 to 200~~0~~1, there was 1 animal per year that was stranded and mutilated and so cause of death was attributed to an unknown human-caused mortality (Table 5).

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals which die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

Table 4. Summary of number of stranded harbor porpoises during January 1, 1994 to December 31, ~~1999~~2001, by state and year.

State	Year								Total
	1994	1995	1996	1997	1998	1999	2000	2001	
Maine	0	0	5	6	5	3	~~1~~2	4	2~~0~~5
New Hampshire	0	0	2	0	0	0	0	0	2
Massachusetts[1,3]	9	26	31	28	18	60	8	39	~~180~~219
Rhode Island	3	0	1	1	0	3	0	1	~~8~~9
Connecticut	0	0	1	0	0	0	0	0	1
New York[4]	7	6	3	10	5	10	2	7	~~43~~50
New Jersey[2]	17	18	12	21	16	23	2	6	1~~0~~915
Delaware	3	5	4	4	7	9	1	3	~~33~~36
Maryland	10	4	3	10	1	21	3	4	5~~2~~6
Virginia	42	18	20	12	3	40	3	28	1~~38~~66
North Carolina	15	9	12	26	4	59	6	21	1~~3~~152
TOTAL	106	86	94	118	59	228	2~~6~~7	113	~~717~~831

[1] During 1996 three animals stranded alive on a Massachusetts beach. They were tagged and released.

[2] Two of the porpoises that stranded on a New Jersey beach in 1998 had been previously tagged and released from an observed mid-Atlantic coastal gill net fishing vessel.

[3] Five animals stranded alive in 1999 and were tagged and released.

[4] One animal stranded alive in 1999, rehabilitated at Mystic Aquarium and died at the aquarium in April 2000.

Table 5. Cause of mortality of USA stranded harbor porpoises during January 1, 1999 to December 31, ~~1999~~2001. "Unique FI" is a fishery interaction that is in a time and area that could not be part of the mortality estimate derived from the observer program. "Not unique FI" is a fishery interaction that was in a time and area that may be part of the observer program derived mortality estimate. "No FI" is the cause of death was determined not to be related to a fishery interaction. "Alive" is stranded animal not dead. "CBD/Unk" is could not be determined or unknown cause of death.

Year	Unique FI[1]	Mutilation[2]	Not unique FI	No FI	Emaciated	CBD/Unk	Alive	Total
1999	19	1	19	41	30	112	6	228
2000	1	1	0	2	0	22	0	26
2001	3	1	10	32	0	64	3	113
Avg ~~99-00~~ 99-01	~~1~~0~~8~~	1	~~9.5~~11	2~~1~~5	1~~5~~0	6~~7~~6	3	12~~7~~72

[1] Attributed to an unknown gillnet fishery.

[2] Attributed to an unknown human-caused mortality.

CANADA

Whales and dolphins stranded between 1991 and 1996 on the coast of Nova Scotia were documented by the Nova Scotia Stranding Network (Hooker *et al.* 1997). Strandings on the beaches of Sable Island during 1970 to 1998 were documented by researchers with Dept. of Fisheries and Oceans, Canada (Lucas and Hooker 2000). Sable Island is approximately 170 km southeast of mainland Nova Scotia. On the mainland of Nova Scotia, a total of 8 stranded harbor porpoises were recorded between 1991 and 1996~~,~~: 1 in May 1991, 2 in 1993 (July and September), 1 in August 1994 ~~was~~ (released alive), 1 in August 1994, and 3 in 1996 (March, April, and July (released alive)). On Sable Island, 8 stranded dead harbor porpoises were documented, most in January and February; 1 in May 1991, 1 in January 1992, 1 in January 1993, 3 in February 1997, 1 in May 1997, and 1 in June 1997. Two strandings during May-June 1997 were neonates (> 80 cm). The harbor porpoises that stranded in the winter (January-February) were on Sable Island, those in the spring (March to June) were in the Bay of Fundy (2 in Minas Basin and 1 near Yarmouth) and on Sable Island (2), and those in the summer (July to September) were scattered along the coast from the Bay of Fundy to Halifax.

USA Management Measures Taken to Reduce Bycatch

A ruling to reduce harbor porpoise bycatch in USA Atlantic gill nets was published in the Federal Register (63 FR 66464) on 01 December 1998 and became effective 01 January 1999. The Gulf of Maine portion of the plan pertains to all fishing with sink gillnets and other gillnets capable of catching multispecies in New England waters, from Maine through Rhode Island. This portion of the rule includes time and area closures, some of which are complete closures; others are closed to multispecies gillnet fishing unless pingers are used in the prescribed manner. Also, the rule requires those who intend to fish using pingers must attend training and certification sessions on the use of the technology. The mid-Atlantic portion of the plan pertains to waters west of 72° 30' W longitude to the mid-Atlantic shoreline from New York to North Carolina. This portion of the rule includes time and area closures, some of which are complete closures; others are closed to gillnet fishing unless the gear meets certain specifications.

STATUS OF STOCK

The status of harbor porpoises, relative to OSP, in the US Atlantic EEZ is unknown. On January 7, 1993, the National Marine Fisheries Service (NMFS) proposed listing the Gulf of Maine harbor porpoise as threatened under the Endangered Species Act (NMFS 1993). On January 5, 1999, NMFS determined the proposed listing was not warranted (NMFS 1999). On August 2, 2001, NMFS made available a review of the biological status of the Gulf of Maine/Bay of Fundy harbor porpoise population. The determination was made that listing under ~~to~~ the Endangered Species Act (ESA) was not warranted and this stock was removed from the ESA candidate species list (50 CFR Part 233). There are insufficient data to determine population trends for this species. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury has not exceeded PBR for the last ~~two~~three years.

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